LEGAL ISSUES RELATING TO FOOTBALL HEAD INJURIES (PART I & II)

HEARINGS

BEFORE THE

COMMITTEE ON THE JUDICIARY
HOUSE OF REPRESENTATIVES

ONE HUNDRED ELEVENTH CONGRESS

FIRST AND SECOND SESSIONS

OCTOBER 28, 2009 AND JANUARY 4, 2010

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LEGAL ISSUES RELATING TO FOOTBALL HEAD INJURIES (PART I)

WEDNESDAY, OCTOBER 28, 2009

HOUSE OF REPRESENTATIVES,
COMMITTEE ON THE JUDICIARY,
Washington, DC.

The Committee met, pursuant to notice, at 10:02 a.m., in room 2141, Rayburn House Office Building, the Honorable John Conyers, Jr. (Chairman of the Committee) presiding.

Present: Representatives Conyers, Scott, Watt, Jackson Lee, Waters, Delahunt, Cohen, Johnson, Quigley, Weiner, Sánchez, Wasserman Schultz, Smith, Coble, Goodlatte, Lungren, King, Jordan, Poe, and Rooney.

Staff Present: (Majority) Eric Tamarkin, Counsel; Jason Everett, Counsel; Elizabeth Kendall, Counsel; Perry Apelbaum, Staff Director and Chief Counsel; Brandon Johns, Staff Assistant; Reuben Goetzl, Staff Assistant; (Minority) Daniel Flores, Counsel; and Sean McLaughlin, Chief of Staff and General Counsel.

Mr. CONYERS. Good morning. The meeting will come to order.

Everyone that plays football at any level knows it is a dangerous sport. In fact, everyone that watches it knows it is a dangerous sport. There should be no surprise when a football player separates his shoulder, twists an ankle, busts a knee. But over the past several years, an increasing number of retired players have developed long-term memory and cognitive diseases such as dementia, Alzheimer's, depression, and chronic traumatic encephalopathy (CTE). And it comes much later than after their careers end. As a matter of fact, sometimes it is not even detected until the autopsies, after they are dead. These are not the types of risks most players or their families ordinarily associate with the game of football.

As the National Football League is a monopoly by way of congressional sanction in 1970, whose existence was legislatively sanctioned, the causes and pervasiveness of these football injuries warrant Federal scrutiny. I say this not because of the impact of these injuries on the 2,000 current players and 10,000 retirees associated with the football league and their families, I say it because of the effect on the millions of players at the college, high school, and youth levels. My 13-year-old-son plays a game at 4:30 at Cranbrook today.

The questions before us are several. How serious is the problem? What can be done about it? And where do we go from here?

There appears to be growing evidence that playing football may be linked to long-term brain damage. For example, a 2003 Univer-

sity of North Carolina study found that professional players who suffered multiple concussions were three times more likely to suffer clinical depression than the general population. A follow-up study in 2005 showed NFL players suffering concussions had five times the rate of cognitive impairment. And retired players were 37 percent more likely to suffer from Alzheimer's than the population as a whole. Earlier this year, the University of Michigan released a study that found that 6.1 percent of NFL players over 50 years of age reported they had received a dementia-related diagnosis—a statistic five times higher than the national average. Players age 30 through 49 showed a rate of 1.9 percent of dementia-related diagnosis 19 times that of the national average.

Last week, *The New York Times* prepared an analysis of the data from the NFL's plan to reimburse retired players for dementia-related medical expenses, which found similar data. Medical researchers also cite autopsies performed on numerous former NFL players, who following their death, were diagnosed to be suffering from CTE brain disease. And some of these deceased players: we remember Mike Webster, a 50-year-old, nine-time Pro Bowl center for the Pittsburgh Steelers who died regrettably a penniless recluse, sleeping on the floor of a Pittsburgh train station. Terry Long, 45-year-old ex-Steeler who died after drinking antifreeze. Andre Waters, a 44-year-old former safety with the Philadelphia Eagles, who suffered from chronic pain and depression and later shot himself in the mouth.

Today Dr. McKee will testify that former Detroit lions offensive lineman Lou Creekmur was tormented by CTE so much that in his final years he lost the ability to speak, and frequently turned violent. Lou was a player who was not the victim of multiple concussions, and he reportedly never missed a game during his 10-year career.

The National Football League is performing its own long-term study, and has largely sought to discredit these reports or some of the conclusions drawn from some of these reports. The football league described the reports as flawed.

Dr. Ira Casson, the co-chair of the NFL's Mild Traumatic Brain Injury Committee, denied the linkage on six separate occasions. When asked whether there was any linkage between playing football and CTE, Dr. Casson stated that it has never been scientifically, validly documented. The league said the recent University of Michigan study was flawed and that further study was necessary. *The New York Times* data released last week, was, they said, for self-promotional and lobbying purposes of the union. Given there is no consensus between the league and its players and the medical community about the causes of these cognitive disorders, it should come as no surprise there is little agreement about how to respond.

Former players believe it is unconscionable that the current disability plans only permit a full disability award for conditions developed within 15 years of retirement. Such a limit, they argue, makes no sense for diseases that frequently take more than 15 years to manifest themselves.

Player advocates also ask why there has not been more done to limit the likelihood of long-term brain injury. For example, giving the Players Association input in the selection of team doctors and

trainers, granting players unlimited access to their medical records, requiring that all injuries be reported to the league and the Players Association, and limiting the frequency of full contact drills to cite some of the possibilities that exist.

The NFL responds that it has set up a no-fault compensation scheme, paying ex-players with dementia up to $88,000 a year, and has instituted rule changes to limit serious injuries and develop standards for concussion management. However, when it comes to making further changes in its disability plan to account for long-term injuries, the NFL asserts that that is a subject for collective bargaining. Now, the answer to how to resolve these differences and where we go from here is the realization that we need an expeditious, independent review of the data.

And so I am asking all parties and their personnel to make their records available to us to permit such review and analysis. The request goes to the NFL, NFLPA, relevant medical researchers, NCAA, and the National Federation of State High School Associations.

Now, when it comes to public health issues, I do not believe it is adequate for the league or the Players Association to hide behind a collective bargaining agreement. Surely, an $8 billion a year industry can find it within its budget to make sure players are adequately protected and that any victims of long-term brain disease are fairly compensated. The serious issues presented in today's hearing are life and death issues. They go to the heart of our Nation's most popular sport. And equally importantly, they affect millions of players of all ages and their families.

I would like now to invite our distinguished Ranking minority Member, Lamar Smith, for his opening remarks.

Mr. SMITH OF TEXAS. Thank you, Mr. Chairman. Mr. Chairman, the recently released University of Michigan study of retired NFL players indicates that overall, retired professional football players are, in fact, in good health. *The New York Times* has suggested that the study also points to higher than normal rates of dementia or other memory-related problems among former players. But the study does not support that view. And prior studies have been argued to point both ways. While we need to take this issue seriously, we should not jump to any conclusions. As the lead author of the Michigan study has stated, "The study did not conclude that football causes dementia." Highly publicized claims that the study supports a link between football and dementia stem largely from *The New York Times* misreporting on the content of the study. The study's authors have drawn this misreporting to *The New York Times'* attention.

The authors stressed that they do not believe "Any responsible scientist would conclude from the study that retired football players had higher rates of dementia than any other group," which was alleged by *The New York Times.* Mr. Chairman, I would like unanimous consent to put a letter to *The New York Times* from the study's authors——

Mr. CONYERS. Without objection, so ordered.

[The information referred to follows:]

ISR INSTITUTE FOR SOCIAL RESEARCH
Social Science in the Public Interest www.isr.umich.edu

October 16, 2009

To the Editor
Sports Desk, New York Times

The New York Times recently printed several stories referring to a study we conducted under the sponsorship of the National Football League Player Care Foundation. Our study was not designed or intended to establish as a medical or scientific matter whether retired football players had higher rates of dementia than any other group, much less whether any such difference could be attributed to concussions or any other football-related exposure. We did not make such claims in the report we submitted to the NFL and do not believe any responsible scientist would draw such conclusions based on our study. We regret that they have been made in the press.

The study we conducted was of retired players only, and was designed to assist the NFL in the development of programs to serve their needs. We did not interview a control group, and we did not diagnose dementia or any other memory-related illness—two crucial requirements of a study designed to measure differences in dementia prevalence. We asked retired players or a family member whether the player had been told by a health professional that they had any memory-related illness, and took exceptional measures to be sure such cases were included in our study so as not to underestimate the need.

To provide the NFL with some sense of perspective on the statistics from our study of retired players, our report included some statistics based on other studies for comparison. As the report was not intended for a scientific audience, we did not consider all available studies and did not exhaustively review possible limitations of the comparison studies. We conveyed our judgment as to the reliability of the comparisons briefly in the text and were particularly cautious with regard to the dementia figures. In fact the comparison study used for dementia and other health conditions dramatically understates the true rates of dementia in the American population, and the levels reported by NFL retirees are within the range of other published estimates for cognitive impairment. In other words, the rates of dementia in the two populations are likely comparable. With respect to the question of whether football causes earlier onset or higher rates of cognitive impairment, our study provides no basis for any conclusion one way or the other, which is why we concluded that further research is warranted.

Our study was intended to find out about the needs of retired players. Whatever the cause, dementia is an extremely difficult experience for the affected person and his or her family, made worse by the lack of coverage for it under Medicare and most private health insurance programs. That is certainly true of many of the 56 individuals in the retired player study who reported a memory-related illness. We encourage any and all efforts by the NFL, the Player's Association, and voluntary actions of former players to ease the burden on the families of retired players in need of assistance.

Sincerely,

James S. Jackson
Professor of Psychology and Director,
Institute for Social Research,
University of Michigan

David R. Weir
Research Professor,
Institute for Social Research,
University of Michigan

OFFICE OF THE DIRECTOR + INSTITUTE FOR SOCIAL RESEARCH + UNIVERSITY OF MICHIGAN
426 Thompson St., PO Box 1248, Ann Arbor, MI 48106-1248 USA + 734.763.2491
Survey Research Center + Research Center for Group Dynamics + Center for Political Studies
Population Studies Center + Inter-university Consortium for Political and Social Research

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Mr. SMITH OF TEXAS [continuing]. Into the record. Thank you, Mr. Chairman. Mr. Chairman, the authors also underscore that "The comparison study used for dementia dramatically understates the true rates of dementia in the American population." In other words, according to the authors themselves, the rates of dementia for retired NFL players "are likely comparable to the American population in general." So we need to be careful about what conclusions regarding dementia and other memory problems we draw from the most recent look at retired players' health.

Professional football is the most popular spectator sport in America. It is important that the league and its players take every effort to make pro football as safe as reasonably possible. The NFL should continue to study the potential long-term effects of head injuries on player health. The league should also study whether equipment improvements or stricter rules enforcement could help to reduce any long-term impacts of head injuries. And, of course, college and high school officials should do the same. But Congress should not attempt to influence the upcoming collective bargaining process the NFL and its players union are about to undertake. We should also avoid the temptation to legislate in this area. Football, like soccer, rugby, and even basketball and baseball, involves contact that can produce injuries. We cannot legislate the elimination of injuries from the games without eliminating the games themselves.

The retired players study concludes, "The study finds retired players to be in very good stead overall. Their history of physical fitness shows up in lower rates of diabetes and cardiovascular disease. Playing in the NFL was a very positive experience for most retired players." Congress can highlight the potential long-term consequences of playing professional football through hearings like this one, but the NFL does not need Congress to referee this issue. While many of us would say that we are fans of football, Monday morning quarterbacking does not necessarily qualify us as experts. Both teams are at the table here today, or will be shortly, and we should work together to find a solution where both the players and the league win.

Mr. Chairman, I look forward to the witnesses' testimony, and hope that this hearing will result in neither in exaggerating the problem of injuries, nor in downplaying the need to look for ways to reduce injuries. Mr. Chairman, thank you, and I will yield back.

Mr. CONYERS. Thank you very much, Mr. Smith. Did Jim Brown of Cleveland come in yet?

Out of the natural generosity of my heart, I am going to allow three people to make 2-minute statements. Ms. Baldwin, Mr. Quigley, and Hank Johnson. If you agree to that, you will be recognized. So we will start off with Tammy Baldwin of Wisconsin.

Ms. BALDWIN. Thank you, Chairman Conyers. I want to thank you for holding this important hearing, as well as extend my thanks to our many witnesses who have taken the time to be with us this morning. I also want to acknowledge the presence of Mr. Willie Wood, a retired NFL player from the Green Bay Packers. As a proud Packer fan, I would like to boast for a moment or two about Mr. Wood. He made the All Pro team nine times in his 12-year career, and played in both Super Bowl I in 1967 and Super Bowl II the following year. Thanks in no small part to Mr. Wood's impressive work as a starting free safety for the Packers, Green Bay won both of those inaugural Super Bowls. He finished his 12 NFL seasons with 48 interceptions, which he returned for 699 yards and two touchdowns. Mr. Wood was inducted into the Pro Football Hall of Fame in 1989.

Mr. Chairman, I know that Wisconsinites and Packer fans across the country are grateful to Mr. Wood for an incredible career. While we all know what an outstanding player he was during his

seasons with the NFL, I think there is less awareness or understanding of the hardships that players like Mr. Wood endure later in life because of a lack of health care coverage. Mr. Wood is currently living in an assisted care facility, and his NFL pension of a little over $1,100 per month is not enough to pay all of his bills. Although he is the beneficiary of what is known as the 88 Plan, these funds are often not enough to cover his monthly medical care. So Mr. Wood relies on the charity of others.

These situations are unfortunately not uncommon among former NFL players suffering from disabilities, and even dementia. We have lots of questions, and that is why we are having this hearing today. I look forward to learning more about the issue from our expert witnesses. Mr. Chairman, I do ask unanimous consent to submit for the record an article called Offensive Play that appeared in The New Yorker.

Mr. CONYERS. We will be happy to introduce that into the record.

Ms. BALDWIN. Thank you.

[The information referred to follows:]

1 of 1 DOCUMENT

THE NEW YORKER
NEWYORKER.COM
The New Yorker

October 19, 2009

Offensive Play;
How different are dogfighting and football?

BYLINE: Malcolm Gladwell

SECTION: FACT; Annals Of Medicine; Pg. 50 Vol. 85 No. 33

LENGTH: 7359 words

One evening in August, Kyle Turley was at a bar in Nashville with his wife and some friends. It was one of the countless little places in the city that play live music. He'd ordered a beer, but was just sipping it, because he was driving home. He had eaten an hour and a half earlier. Suddenly, he felt a sensation of heat. He was light-headed, and began to sweat. He had been having episodes like that with increasing frequency during the past year-headaches, nausea. One month, he had vertigo every day, bouts in which he felt as if he were stuck to a wall. But this was worse. He asked his wife if he could sit on her stool for a moment. The warmup band was still playing, and he remembers saying, "I'm just going to take a nap right here until the next band comes on." Then he was lying on the floor, and someone was standing over him. "The guy was freaking out," Turley recalled. "He was saying, 'Damn, man, I couldn't find a pulse,' and my wife said, 'No, no. You were breathing.' I'm, like, 'What? What?' "

They picked him up. "We went out in the parking lot, and I just lost it," Turley went on. "I started puking everywhere. I couldn't stop. I got in the car, still puking. My wife, she was really scared, because I had never passed out like that before, and I started becoming really paranoid. I went into a panic. We get to the emergency room. I started to lose control. My limbs were shaking, and I couldn't speak. I was conscious, but I couldn't speak the words I wanted to say."

Turley is six feet five. He is thirty-four years old, with a square jaw and blue eyes. For nine years, before he retired, in 2007, he was an offensive lineman in the National Football League. He knew all the stories about former football players. Mike Webster, the longtime Pittsburgh Steeler and one of the greatest players in N.F.L. history, ended his life a recluse, sleeping on the floor of the Pittsburgh Amtrak station. Another former Pittsburgh Steeler, Terry Long, drifted into chaos and killed himself four years ago by drinking antifreeze. Andre Waters, a former defensive back for the Philadelphia Eagles, sank into depression and pleaded with his girlfriend-"I need help, somebody help me"-before shooting himself in the head. There were men with aching knees and backs and hands, from all those years of playing football. But their real problem was with their heads, the one part of their body that got hit over and over again.

"Lately, I've tried to break it down," Turley said. "I remember, every season, multiple occasions where I'd hit

someone so hard that my eyes went cross-eyed, and they wouldn't come uncrossed for a full series of plays. You are just out there, trying to hit the guy in the middle, because there are three of them. You don't remember much. There are the cases where you hit a guy and you'd get into a collision where everything goes *off*. You're dazed. And there are the others where you are involved in a big, long drive. You start on your own five-yard line, and drive all the way down the field-fifteen, eighteen plays in a row sometimes. Every play: collision, collision, collision. By the time you get to the other end of the field, you're seeing spots. You feel like you are going to black out. Literally, these white explosions-*boom, boom, boom*-lights getting dimmer and brighter, dimmer and brighter.

"Then, there was the time when I got knocked unconscious. That was in St. Louis, in 2003. My wife said that I was out a minute or two on the field. But I was *gone* for about four hours after that. It was the last play of the third quarter. We were playing the Packers. I got hit in the back of the head. I saw it on film a little while afterward. I was running downfield, made a block on a guy. We fell to the ground. A guy was chasing the play, a little guy, a defensive back, and he jumped over me as I was coming up, and he kneed me right in the back of the head. *Boom!*

"They sat me down on the bench. I remember Marshall Faulk coming up and joking with me, because he knew that I was messed up. That's what happens in the N.F.L.: 'Oooh. You got effed up. Oooh.' The trainer came up to me and said, 'Kyle, let's take you to the locker room.' I remember looking up at a clock, and there was only a minute and a half left in the game-and I had no idea that much time had elapsed. I showered and took all my gear off. I was sitting at my locker. I don't remember anything. When I came back, after being hospitalized, the guys were joking with me because Georgia Frontiere"-then the team's owner-"came in the locker room, and they said I was butt-ass naked and I gave her a big hug. They were dying laughing, and I was, like, 'Are you serious? I did that?'

"They cleared me for practice that Thursday. I probably shouldn't have. I don't know what damage I did from that, because my head was really hurting. But when you're coming off an injury you're frustrated. I wanted to play the next game. I was just so mad that this happened to me that I'm overdoing it. I was just going after guys in practice. I was really trying to use my head more, because I was so frustrated, and the coaches on the sidelines are, like, 'Yeah. We're going to win this game. He's going to lead the team.' That's football. You're told either that you're hurt or that you're injured. There is no middle ground. If you are hurt, you can play. If you are injured, you can't, and the line is whether you can walk and if you can put on a helmet and pads."

Turley said that he loved playing football so much that he would do it all again. Then he began talking about what he had gone through in the past year. The thing that scared him most about that night at the bar was that it felt exactly like the time he was knocked unconscious. "It was identical," he said. "It was my worst episode ever."

In August of 2007, one of the highest-paid players in professional football, the quarterback Michael Vick, pleaded guilty to involvement in a dogfighting ring. The police raided one of his properties, a farm outside Richmond, Virginia, and found the bodies of dead dogs buried on the premises, along with evidence that some of the animals there had been tortured and electrocuted. Vick was suspended from football. He was sentenced to twenty-three months in prison. The dogs on his farm were seized by the court, and the most damaged were sent to an animal sanctuary in Utah for rehabilitation. When Vick applied for reinstatement to the National Football League, this summer, he was asked to undergo psychiatric testing. He then met with the commissioner of the league, Roger Goodell, for four and a half hours, so that Goodell could be sure that he was genuinely remorseful.

"I probably considered every alternative that I could think of," Goodell told reporters, when he finally allowed Vick back into the league. "I reached out to an awful lot of people to get their views-not only on what was right for the young man but also what was right for our society and the N.F.L."

Goodell's job entails dealing with players who have used drugs, driven drunk and killed people, fired handguns in night clubs, and consorted with thugs and accused murderers. But he clearly felt what many Americans felt as well-that dogfighting was a moral offense of a different order.

Here is a description of a dogfight given by the sociologists Rhonda Evans and Craig Forsyth in "The Social Milieu of Dogmen and Dogfights," an article they published some years ago in the journal *Deviant Behavior*. The fight took place in Louisiana between a local dog, Black, owned by a man named L.G., and Snow, whose owner, Rick, had come from Arizona:

The handlers release their dogs and Snow and Black lunge at one another. Snow rears up and overpowers Black, but Black manages to come back with a quick locking of the jaws on Snow's neck. The crowd is cheering wildly and yelling out bets. Once a dog gets a lock on the other, they will hold on with all their might. The dogs flail back and forth and all the while Black maintains her hold.

In a dogfight, whenever one of the dogs "turns"-makes a submissive gesture with its head-the two animals are separated and taken back to their corners. Each dog, in alternation, then "scratches"-is released to charge at its opponent. After that first break, it is Snow's turn to scratch. She races toward Black:

Snow goes straight for the throat and grabs hold with her razor-sharp teeth. Almost immediately, blood flows from Black's throat. Despite a serious injury to the throat, Black manages to continue fighting back. They are relentless, each battling the other and neither willing to accept defeat. This fighting continues for an hour. [Finally, the referee] gives the third and final pit call. It is Black's turn to scratch and she is severely wounded. Black manages to crawl across the pit to meet her opponent. Snow attacks Black and she is too weak to fight back. L.G. realizes that this is it for Black and calls the fight. Snow is declared the winner.

Afterward, Snow's owner collects his winnings; L.G. carries Black from the ring. "Her back legs are broken and blood is gushing from her throat," Evans and Forsyth write. "A shot rings out barely heard over the noise in the barn. Black's body is wrapped up and carried by her owner to his vehicle."

It's the shot ringing out that seals the case against dogfighting. L.G. willingly submitted his dog to a contest that culminated in her suffering and destruction. And why? For the entertainment of an audience and the chance of a payday. In the nineteenth century, dogfighting was widely accepted by the American public. But we no longer find that kind of transaction morally acceptable in a sport. "I was not aware of dogfighting and the terrible things that happen around dogfighting," Goodell said, explaining why he responded so sternly in the Vick case. One wonders whether, had he spent as much time talking to Kyle Turley as he did to Michael Vick, he'd start to have similar doubts about his own sport.

In 2003, a seventy-two-year-old patient at the Veterans Hospital in Bedford, Massachusetts, died, fifteen years after receiving a diagnosis of dementia. Patients in the hospital's dementia ward are routinely autopsied, as part of the V.A.'s research efforts, so the man's brain was removed and "fixed" in a formaldehyde solution. A laboratory technician placed a large slab of the man's cerebral tissue on a microtome-essentially, a sophisticated meat slicer-and, working along the coronal plane, cut off dozens of fifty-micron shavings, less than a hairbreadth thick. The shavings were then immunostained-bathed in a special reagent that would mark the presence of abnormal proteins with a bright, telltale red or brown stain on the surface of the tissue. Afterward, each slice was smoothed out and placed on a slide.

The stained tissue of Alzheimer's patients typically shows the two trademarks of the disease-distinctive patterns of the proteins beta-amyloid and tau. Beta-amyloid is thought to lay the groundwork for dementia. Tau marks the critical second stage of the disease: it's the protein that steadily builds up in brain cells, shutting them down and ultimately killing them. An immunostain of an Alzheimer's patient looks, under the microscope, as if the tissue had been hit with a shotgun blast: the red and brown marks, corresponding to amyloid and tau, dot the entire surface. But this patient's brain was different. There was damage only to specific surface regions of his brain, and the stains for amyloid came back negative. "This was all tau," Ann McKee, who runs the hospital's neuropathology laboratory, said. "There was not even a whiff of amyloid. And it was the most extraordinary damage. It was one of those cases that really took you aback." The patient may have been in an Alzheimer's facility, and may have looked and acted as if he had Alzheimer's. But McKee realized that he had a different condition, called chronic traumatic encephalopathy (C.T.E.), which is a

progressive neurological disorder found in people who have suffered some kind of brain trauma. C.T.E. has many of the same manifestations as Alzheimer's: it begins with behavioral and personality changes, followed by disinhibition and irritability, before moving on to dementia. And C.T.E. appears later in life as well, because it takes a long time for the initial trauma to give rise to nerve-cell breakdown and death. But C.T.E. isn't the result of an endogenous disease. It's the result of injury. The patient, it turned out, had been a boxer in his youth. He had suffered from dementia for fifteen years because, decades earlier, he'd been hit too many times in the head.

McKee's laboratory does the neuropathology work for both the giant Framingham heart study, which has been running since 1948, and Boston University's New England Centenarian Study, which analyzes the brains of people who are unusually long-lived. "I'm looking at brains constantly," McKee said. "Then I ran across another one. I saw it and said, 'Wow, it looks just like the last case.' This time, there was no known history of boxing. But then I called the family, and heard that the guy had been a boxer in his twenties." You can't see tau except in an autopsy, and you can't see it in an autopsy unless you do a very particular kind of screen. So now that McKee had seen two cases, in short order, she began to wonder: how many people who we assume have Alzheimer's-a condition of mysterious origin-are actually victims of preventable brain trauma?

McKee linked up with an activist named Chris Nowinski, a former college football player and professional wrestler who runs a group called the Sports Legacy Institute, in Boston. In his football and wrestling careers, Nowinski suffered six concussions (that he can remember), the last of which had such severe side effects that he has become a full-time crusader against brain injuries in sports. Nowinski told McKee that he would help her track down more brains of ex-athletes. Whenever he read an obituary of someone who had played in a contact sport, he'd call up the family and try to persuade them to send the player's brain to Bedford. Usually, they said no. Sometimes they said yes. The first brain McKee received was from a man in his mid-forties who had played as a linebacker in the N.F.L. for ten years. He accidentally shot himself while cleaning a gun. He had at least three concussions in college, and eight in the pros. In the years before his death, he'd had memory lapses, and had become more volatile. McKee immunostained samples of his brain tissue, and saw big splotches of tau all over the frontal and temporal lobes. If he hadn't had the accident, he would almost certainly have ended up in a dementia ward.

Nowinski found her another ex-football player. McKee saw the same thing. She has now examined the brains of sixteen ex-athletes, most of them ex-football players. Some had long careers and some played only in college. Some died of dementia. Some died of unrelated causes. Some were old. Some were young. Most were linemen or linebackers, although there was one wide receiver. In one case, a man who had been a linebacker for sixteen years, you could see, without the aid of magnification, that there was trouble: there was a shiny tan layer of scar tissue, right on the surface of the frontal lobe, where the brain had repeatedly slammed into the skull. It was the kind of scar you'd get only if you used your head as a battering ram. You could also see that some of the openings in the brain were larger than you'd expect, as if the surrounding tissue had died and shrunk away. In other cases, everything seemed entirely normal until you looked under the microscope and saw the brown ribbons of tau. But all sixteen of the ex-athlete brains that McKee had examined-those of the two boxers, plus the ones that Nowinski had found for her-had something in common: every one had abnormal tau.

The other major researcher looking at athletes and C.T.E. is the neuropathologist Bennet Omalu. He diagnosed the first known case of C.T.E. in an ex-N.F.L. player back in September of 2002, when he autopsied the former Pittsburgh Steelers center Mike Webster. He also found C.T.E. in the former Philadelphia Eagles defensive back Andre Waters, and in the former Steelers linemen Terry Long and Justin Strzelczyk, the latter of whom was killed when he drove the wrong way down a freeway and crashed his car, at ninety miles per hour, into a tank truck. Omalu has only once failed to find C.T.E. in a professional football player, and that was a twenty-four-year-old running back who had played in the N.F.L. for only two years.

"There is something wrong with this group as a cohort," Omalu says. "They forget things. They have slurred speech. I have had an N.F.L. player come up to me at a funeral and tell me he can't find his way home. I have wives who call me and say, 'My husband was a very good man. Now he drinks all the time. I don't know why his behavior

changed.' I have wives call me and say, 'My husband was a nice guy. Now he's getting abusive.' I had someone call me and say, 'My husband went back to law school after football and became a lawyer. Now he can't do his job. People are suing him.' "

McKee and Omalu are trying to make sense of the cases they've seen so far. At least some of the players are thought to have used steroids, which has led to the suggestion that brain injury might in some way be enhanced by drug use. Many of the players also share a genetic risk factor for neurodegenerative diseases, so perhaps deposits of tau are the result of brain trauma coupled with the weakened ability of the brain to repair itself. McKee says that she will need to see at least fifty cases before she can draw any firm conclusions. In the meantime, late last month the University of Michigan's Institute for Social Research released the findings of an N.F.L.-funded phone survey of just over a thousand randomly selected retired N.F.L. players-all of whom had played in the league for at least three seasons. Self-reported studies are notoriously unreliable instruments, but, even so, the results were alarming. Of those players who were older than fifty, 6.1 per cent reported that they had received a diagnosis of "dementia, Alzheimer's disease, or other memory-related disease." That's five times higher than the national average for that age group. For players between the ages of thirty and forty-nine, the reported rate was nineteen times the national average. (The N.F.L. has distributed five million dollars to former players with dementia.)

"A long time ago, someone suggested that the [C.T.E. rate] in boxers was twenty per cent," McKee told me. "I think it's probably higher than that among boxers, and I also suspect that it's going to end up being higher than that among football players as well. Why? Because every brain I've seen has this. To get this number in a sample this small is really unusual, and the findings are so far out of the norm. I only can say that because I have looked at thousands of brains for a long time. This isn't something that you just see. I did the same exact thing for all the individuals from the Framingham heart study. We study them until they die. I run these exact same proteins, make these same slides-and we never see this."

McKee's laboratory occupies a warren of rooms, in what looks like an old officers' quarters on the V.A. campus. In one of the rooms, there is an enormous refrigerator, filled with brains packed away in hundreds of plastic containers. Nearby is a tray with small piles of brain slices. They look just like the ginger shavings that come with an order of sushi. Now McKee went to the room next to her office, sat down behind a microscope, and inserted one of the immunostained slides under the lens.

"This is Tom McHale," she said. "He started out playing for Cornell. Then he went to Tampa Bay. He was the man who died of substance abuse at the age of forty-five. I only got fragments of the brain. But it's just showing huge accumulations of tau for a forty-five-year-old-ridiculously abnormal."

She placed another slide under the microscope. "This individual was forty-nine years old. A football player. Cognitively intact. He never had any rage behavior. He had the distinctive abnormalities. Look at the hypothalamus." It was dark with tau. She put another slide in. "This guy was in his mid-sixties," she said. "He died of an unrelated medical condition. His name is Walter Hilgenberg. Look at the hippocampus. It's wall-to-wall tangles. Even in a bad case of Alzheimer's, you don't see that." The brown pigment of the tau stain ran around the edge of the tissue sample in a thick, dark band. "It's like a big river."

McKee got up and walked across the corridor, back to her office. "There's one last thing," she said. She pulled out a large photographic blowup of a brain-tissue sample. "This is a kid. I'm not allowed to talk about how he died. He was a good student. This is his brain. He's eighteen years old. He played football. He'd been playing football for a couple of years." She pointed to a series of dark spots on the image, where the stain had marked the presence of something abnormal. "He's got all this tau. This is frontal and this is insular. Very close to insular. Those same vulnerable regions." This was a teen-ager, and already his brain showed the kind of decay that is usually associated with old age. "This is completely inappropriate," she said. "You don't see tau like this in an eighteen-year-old. You don't see tau like this in a *fifty*-year-old."

McKee is a longtime football fan. She is from Wisconsin. She had two statuettes of Brett Favre, the former Green Bay Packers quarterback, on her bookshelf. On the wall was a picture of a robust young man. It was McKee's son-nineteen years old, six feet three. If he had a chance to join the N.F.L., I asked her, what would she advise him? "I'd say, 'Don't. Not if you want to have a life after football.' "

At the core of the C.T.E. research is a critical question: is the kind of injury being uncovered by McKee and Omalu incidental to the game of football or inherent in it? Part of what makes dogfighting so repulsive is the understanding that violence and injury cannot be removed from the sport. It's a feature of the sport that dogs almost always get hurt. Something like stock-car racing, by contrast, is dangerous, but not unavoidably so.

In 2000 and 2001, four drivers in Nascar's élite Sprint Cup Series were killed in crashes, including the legendary Dale Earnhardt. In response, Nascar mandated stronger seats, better seat belts and harnesses, and ignition kill switches, and completed the installation of expensive new barriers on the walls of its racetracks, which can absorb the force of a crash much better than concrete. The result is that, in the past eight years, no one has died in Nascar's three national racing series. Stock-car fans are sometimes caricatured as bloodthirsty, eagerly awaiting the next spectacular crash. But there is little blood these days in Nascar crashes. Last year, at Texas Motor Speedway, Michael McDowell hit an oil slick, slammed head first into the wall at a hundred and eighty miles per hour, flipped over and over, leaving much of his car in pieces on the track, and, when the vehicle finally came to a stop, crawled out of the wreckage and walked away. He raced again the next day. So what is football? Is it dogfighting or is it stock-car racing?

Football faced a version of this question a hundred years ago, after a series of ugly incidents. In 1905, President Theodore Roosevelt called an emergency summit at the White House, alarmed, as the historian John Sayle Watterson writes, "that the brutality of the prize ring had invaded college football and might end up destroying it." Columbia University dropped the sport entirely. A professor at the University of Chicago called it a "boy-killing, man-mutilating, money-making, education-prostituting, gladiatorial sport." In December of 1905, the presidents of twelve prominent colleges met in New York and came within one vote of abolishing the game. But the main objection at the time was to a style of play-densely and dangerously packed offensive strategies-that, it turns out, could be largely corrected with rule changes, like the legalization of the forward pass and the doubling of the first-down distance from five yards to ten. Today, when we consider subtler and more insidious forms of injury, it's far from clear whether the problem is the style of play or the play itself.

Take the experience of a young defensive lineman for the University of North Carolina football team, who suffered two concussions during the 2004 season. His case is one of a number studied by Kevin Guskiewicz, who runs the university's Sports Concussion Research Program. For the past five seasons, Guskiewicz and his team have tracked every one of the football team's practices and games using a system called HITS, in which six sensors are placed inside the helmet of every player on the field, measuring the force and location of every blow he receives to the head. Using the HITS data, Guskiewicz was able to reconstruct precisely what happened each time the player was injured.

"The first concussion was during preseason. The team was doing two-a-days," he said, referring to the habit of practicing in both the morning and the evening in the preseason. "It was August 9th, 9:55 A.M. He has an 80-g hit to the front of his head. About ten minutes later, he has a 98-g acceleration to the front of his head." To put those numbers in perspective, Guskiewicz explained, if you drove your car into a wall at twenty-five miles per hour and you weren't wearing your seat belt, the force of your head hitting the windshield would be around 100 gs; in effect, the player had two car accidents that morning. He survived both without incident. "In the evening session, he experiences this 64-g hit to the same spot, the front of the head. Still not reporting anything. And then this happens." On his laptop, Guskiewicz ran the video from the practice session. It was a simple drill: the lineman squaring off against an offensive player who wore the number 76. The other player ran toward the lineman and brushed past him, while delivering a glancing blow to the defender's helmet. "Seventy-six does a little quick elbow. It's 63 gs, the lowest of the four, but he sustains a concussion."

"The second injury was nine weeks later," Guskiewicz continued. "He's now recovered from the initial injury. It's a

game out in Utah. In warmups, he takes a 76-g blow to the front of his head. Then, on the very first play of the game, on kickoff, he gets popped in the earhole. It's a 102-g impact. He's part of the wedge." He pointed to the screen, where the player was blocking on a kickoff: "Right here." The player stumbled toward the sideline. "His symptoms were significantly worse than the first injury." Two days later, during an evaluation in Guskiewicz's clinic, he had to have a towel put over his head because he couldn't stand the light. He also had difficulty staying awake. He was sidelined for sixteen days.

When we think about football, we worry about the dangers posed by the heat and the fury of competition. Yet the HITS data suggest that practice-the routine part of the sport-can be as dangerous as the games themselves. We also tend to focus on the dramatic helmet-to-helmet hits that signal an aggressive and reckless style of play. Those kinds of hits can be policed. But what sidelined the U.N.C. player, the first time around, was an accidental and seemingly innocuous elbow, and none of the blows he suffered that day would have been flagged by a referee as illegal. Most important, though, is what Guskiewicz found when he reviewed all the data for the lineman on that first day in training camp. He didn't just suffer those four big blows. He was hit in the head *thirty-one times* that day. What seems to have caused his concussion, in other words, was his cumulative exposure. And why was the second concussion-in the game at Utah-so much more serious than the first? It's not because that hit to the side of the head was especially dramatic; it was that it came after the 76-g blow in warmup, which, in turn, followed the concussion in August, which was itself the consequence of the thirty prior hits that day, and the hits the day before that, and the day before that, and on and on, perhaps back to his high-school playing days.

This is a crucial point. Much of the attention in the football world, in the past few years, has been on concussions-on diagnosing, managing, and preventing them-and on figuring out how many concussions a player can have before he should call it quits. But a football player's real issue isn't simply with repetitive concussive trauma. It is, as the concussion specialist Robert Cantu argues, with repetitive *subconcussive* trauma. It's not just the handful of big hits that matter. It's lots of little hits, too.

That's why, Cantu says, so many of the ex-players who have been given a diagnosis of C.T.E. were linemen: line play lends itself to lots of little hits. The HITS data suggest that, in an average football season, a lineman could get struck in the head a thousand times, which means that a ten-year N.F.L. veteran, when you bring in his college and high-school playing days, could well have been hit in the head eighteen thousand times: that's thousands of jarring blows that shake the brain from front to back and side to side, stretching and weakening and tearing the connections among nerve cells, and making the brain increasingly vulnerable to long-term damage. People with C.T.E., Cantu says, "aren't necessarily people with a high, recognized concussion history. But they are individuals who collided heads on every play-repetitively doing this, year after year, under levels that were tolerable for them to continue to play."

But if C.T.E. is really about lots of little hits, what can be done about it? Turley says that it's impossible for an offensive lineman to do his job without "using his head." The position calls for the player to begin in a crouch and then collide with the opposing lineman when the ball is snapped. Helmet-to-helmet contact is inevitable. Nowinski, who played football for Harvard, says that "proper" tackling technique is supposed to involve a player driving into his opponent with his shoulder. "The problem," he says, "is that, if you're a defender and you're trying to tackle someone and you decide to pick a side, you're giving the other guy a way to go-and people will start running around you." Would better helmets help? Perhaps. And there have been better models introduced that absorb more of the shock from a hit. But, Nowinski says, the better helmets have become-and the more invulnerable they have made the player seem-the more athletes have been inclined to play recklessly.

"People love technological solutions," Nowinski went on. "When I give speeches, the first question is always: 'What about these new helmets I hear about?' What most people don't realize is that we are decades, if not forever, from having a helmet that would fix the problem. I mean, you have two men running into each other at full speed and you think a little bit of plastic and padding could absorb that 150 gs of force?"

At one point, while he was discussing his research, Guskiewicz showed a videotape from a 1997 college football

game between Arizona and Oregon. In one sequence, a player from Oregon viciously tackles an Arizona player, bringing his head up onto the opposing player's chin and sending his helmet flying with the force of the blow. To look at it, you'd think that the Arizona player would be knocked unconscious. Instead, he bounces back up. "This guy does not sustain a concussion," Guskiewicz said. "He has a lip laceration. Lower lip, that's it. Now, same game, twenty minutes later." He showed a clip of an Arizona defensive back making a dramatic tackle. He jumps up, and, as he does so, a teammate of his chest-bumps him in celebration. The defensive back falls and hits his head on the ground. "That's a Grade 2 concussion," Guskiewicz said. "It's the fall to the ground, combined with the bounce off the turf."

The force of the first hit was infinitely greater than the second. But the difference is that the first player saw that he was about to be hit and tensed his neck, which limited the sharp back-and-forth jolt of the head that sends the brain crashing against the sides of the skull. In essence, he was being hit not in the head but in the head, neck, and torso-an area with an effective mass three times greater. In the second case, the player didn't see the hit coming. His head took the full force of the blow all by itself. That's why he suffered a concussion. But how do you insure, in a game like football, that a player is never taken by surprise?

Guskiewicz and his colleagues have come up with what they believe is a much better method of understanding concussion. They have done a full cognitive workup of the players on the U.N.C. team, so that they can track whatever effect might arise from the hits each player accumulates during his four years. U.N.C.'s new coach, Butch Davis, has sharply cut back on full-contact practices, reducing the toll on the players' heads. Guskiewicz says his data show that a disproportionate number of serious head impacts happen on kickoffs, so he wonders whether it might make sense, in theory, anyway, to dispense with them altogether. But, like everyone else who's worried about football, he still has no idea what the inherent risks of the game are. What if you did everything you could, and banned kickoffs and full-contact practices and used the most state-of-the-art techniques for diagnosing and treating concussion, and behaved as responsibly as Nascar has in the past several years-and players were still getting too many dangerous little hits to the head?

After the tape session, Guskiewicz and one of his colleagues, Jason Mihalik, went outside to watch the U.N.C. football team practice, a short walk down the hill from their office. Only when you see football at close range is it possible to understand the dimensions of the brain-injury problem. The players were huge-much larger than you imagine them being. They moved at astonishing speeds for people of that size, and, long before you saw them, you heard them: the sound of one two-hundred-and-fifty-pound man colliding with another echoed around the practice facility. Mihalik and Guskiewicz walked over to a small building, just off to the side of the field. On the floor was a laptop inside a black storage crate. Next to the computer was an antenna that received the signals from the sensors inside the players' helmets. Mihalik crouched down and began paging through the data. In one column, the HITS software listed the top hits of the practice up to that point, and every few moments the screen would refresh, reflecting the plays that had just been run on the field. Forty-five minutes into practice, the top eight head blows on the field measured 82 gs, 79 gs, 75 gs, 79 gs, 67 gs, 60 gs, 57 gs, and 53 gs. One player, a running back, had received both the 79 gs and the 60 gs, as well as another hit, measuring 27.9 gs. This wasn't a full-contact practice. It was "shells." The players wore only helmets and shoulder pads, and still there were mini car crashes happening all over the field.

The most damaged, scarred, and belligerent of Michael Vick's dogs-the hardest cases-were sent to the Best Friends Animal Sanctuary, on a thirty-seven-hundred-acre spread in the canyons of southern Utah. They were housed in a specially modified octagon, a one-story, climate-controlled cottage, ringed by individual dog runs. The dogs were given a final walk at 11 P.M. and woken up at 7 A.M., to introduce them to a routine. They were hand-fed. In the early months, the staff took turns sleeping in the octagon-sometimes in the middle, sometimes in a cot in one of the runs-so that someone would be with the dogs twenty-four hours a day. Twenty-two of Vick's pit bulls came to Best Friends in January of 2008, and all but five of them are still there.

Ray lunged at his handlers when he first came to Best Friends. He can't be with other dogs. Ellen lies on the ground and wants her stomach scratched, and when the caregivers slept in the octagon she licked them all night long. Her face is lopsided, as if it had been damaged from fighting. She can't be with other dogs, either. Georgia has a broken tail, and

her legs and snout are covered with scars. She has no teeth. At some point, in her early life, they had been surgically removed. The court-ordered evaluation of the Vick dogs labelled Meryl, a medium-sized brown-and-white pit-bull mix, "human aggressive," meaning that she is never allowed to be taken out of the Best Friends facility. "She had a hard time meeting people-she would preëmpt anyone coming by charging and snapping at them," Ann Allums, one of the Best Friends dog trainers, said, as she walked around Meryl's octagon, on a recent fall day.

She opened the gate to Meryl's dog run and crouched down on the ground next to her. She hugged the dog, and began playfully wrestling with her, as Meryl's tail thumped happily. "She really doesn't mind new people," Allums said. "She's very happy and loving. I feel totally comfortable with her. I can grab and kiss her." She gave Meryl another hug. "I am building a relationship," she said. "She needed to see that when people were around bad things would not happen."

What happens at Best Friends represents, by any measure, an extravagant gesture. These are dogs that will never live a normal life. But the kind of crime embodied by dogfighting is so morally repellent that it demands an extravagant gesture in response. In a fighting dog, the quality that is prized above all others is the willingness to persevere, even in the face of injury and pain. A dog that will not do that is labelled a "cur," and abandoned. A dog that keeps charging at its opponent is said to possess "gameness," and game dogs are revered.

In one way or another, plenty of organizations select for gameness. The Marine Corps does so, and so does medicine, when it puts young doctors through the exhausting rigors of residency. But those who select for gameness have a responsibility not to abuse that trust: if you have men in your charge who would jump off a cliff for you, you cannot march them to the edge of the cliff-and dogfighting fails this test. Gameness, Carl Semencic argues, in "The World of Fighting Dogs" (1984), is no more than a dog's "desire to please an owner at any expense to itself." The owners, Semencic goes on,

understand this desire to please on the part of the dog and capitalize on it. At any organized pit fight in which two dogs are really going at each other wholeheartedly, one can observe the owner of each dog changing his position at pit-side in order to be in sight of his dog at all times. The owner knows that seeing his master rooting him on will make a dog work all the harder to please its master.

This is why Michael Vick's dogs weren't euthanized. The betrayal of loyalty requires an act of social reparation.

Professional football players, too, are selected for gameness. When Kyle Turley was knocked unconscious, in that game against the Packers, he returned to practice four days later because, he said, "I didn't want to miss a game." Once, in the years when he was still playing, he woke up and fell into a wall as he got out of bed. "I start puking all over," he recalled. "So I said to my wife, 'Take me to practice.' I didn't want to miss practice." The same season that he was knocked unconscious, he began to have pain in his hips. He received three cortisone shots, and kept playing. At the end of the season, he discovered that he had a herniated disk. He underwent surgery, and four months later was back at training camp. "They put me in full-contact practice from day one," he said. "After the first day, I knew I wasn't right. They told me, 'You've had the surgery. You're fine. You should just fight through it.' It's like you're programmed. You've got to go without question-*I'm a warrior. I can block that out of my mind.* I go out, two days later. Full contact. Two-a-days. My back locks up again. I had re-herniated the same disk that got operated on four months ago, and bulged the disk above it." As one of Turley's old coaches once said, "He plays the game as it should be played, all out," which is to say that he put the game above his own well-being.

Turley says he was once in the training room after a game with a young linebacker who had suffered a vicious hit on a kickoff return. "We were in the cold tub, which is, like, forty-five degrees, and he starts passing out. In the cold tub. I don't know anyone who has ever passed out in the cold tub. That's supposed to wake you up. And I'm, like, slapping his face. 'Richie! Wake up!' He said, 'What, what? I'm cool.' I said, 'You've got a concussion. You have to go to the hospital.' He said, 'You know, man, I'm fine.' " He wasn't fine, though. That moment in the cold tub represented a betrayal of trust. He had taken the hit on behalf of his team. He was then left to pass out in the cold tub, and to deal-ten

and twenty years down the road-with the consequences. No amount of money or assurances about risk freely assumed can change the fact that, in this moment, an essential bond had been broken. What football must confront, in the end, is not just the problem of injuries or scientific findings. It is the fact that there is something profoundly awry in the relationship between the players and the game.

"Let's assume that Dr. Omalu and the others are right," Ira Casson, who co-chairs an N.F.L. committee on brain injury, said. "What should we be doing differently? We asked Dr. McKee this when she came down. And she was honest, and said, 'I don't know how to answer that.' No one has any suggestions-assuming that you aren't saying no more football, because, let's be honest, that's not going to happen." Casson began to talk about the research on the connection between C.T.E. and boxing. It had been known for eighty years. Boxers ran a twenty-per-cent risk of dementia. Yet boxers continue to box. Why? Because people still go to boxing matches.

"We certainly know from boxers that the incidence of C.T.E. is related to the length of your career," he went on. "So if you want to apply that to football-and I'm not saying it does apply-then you'd have to let people play six years and then stop. If it comes to that, maybe we'll have to think about that. On the other hand, nobody's willing to do this in boxing. Why would a boxer at the height of his career, six or seven years in, stop fighting, just when he's making million-dollar paydays?" He shrugged. "It's a violent game. I suppose if you want to you could play touch football or flag football. For me, as a Jewish kid from Long Island, I'd be just as happy if we did that. But I don't know if the fans would be happy with that. So what else do you do?"

Casson is right. There is nothing else to be done, not so long as fans stand and cheer. We are in love with football players, with their courage and grit, and nothing else-neither considerations of science nor those of morality-can compete with the destructive power of that love.

In "Dogmen and Dogfights," Evans and Forsyth write:

When one views a staged dog fight between pit bulls for the first time, the most macabre aspect of the event is that the only sounds you hear from these dogs are those of crunching bones and cartilage. The dogs rip and tear at each other; their blood, urine and saliva splatter the sides of the pit and clothes of the handlers. . . . The emotions of the dogs are conspicuous, but not so striking, even to themselves, are the passions of the owners of the dogs. Whether they hug a winner or in the rare case, destroy a dying loser, whether they walk away from the carcass or lay crying over it, their fondness for these fighters is manifest.

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Mr. CONYERS. Dan Lungren, California.

Mr. LUNGREN. Thank you very much, Mr. Chairman. I just make several points. Number one, I appreciate this hearing, although I am surprised that this hearing takes precedence over us reconsidering the major elements of the PATRIOT Act which have to be determined in our effort on the war on terror before they expire. Secondly, I must say that I had the good fortune of getting to know

John Mackey through Jack Kemp, and have seen the deterioration of that great man, a leader in the NFL and the players union, and believe that an investigation of the kind of injuries suffered in the NFL and other levels of football is appropriate.

And third, I hope that beyond everything we are dealing with here, that the greatest thing that can come out of this is serious studies as to the impact of the use of equipment, the head as a weapon in football, and the rules to protect players that will not only affect the NFL, college, but high school as well. Too often I hear on television commentators talking about the great hit. And you examine the hit, and it is often a hit used with the head or not an enforced rule against head hits, both on the pro, the college, and the high school level. And if there is any one thing we could do, it would be to show that it is not a game to destroy people's brains with respect to the misuse of helmets and the misuse of the head during football.

I love football, I grew up loving football, I happened to go to Notre Dame, I know a good number of guys who played in the NFL, but we ought to face facts. Football is a great game, but using the head in the way it has developed, with the protection of the helmet, people don't understand you don't have to worry about breaking teeth any more and breaking jaws, but because we have that comfort, too often the helmet encasing the head allows players to believe they are invulnerable because we can't see the injury.

The injury is impactful, the injury is long lasting, and we ought to at least get as much information as we can so we can be honest about the decisions we make. Thank you very much, Mr. Chairman.

Mr. CONYERS. Thank you, Mr. Lungren. Mike Quigley of Illinois.

Mr. QUIGLEY. Thank you, Mr. Chairman. Well then, let me try to focus this on a broader scale. If our concern is that perhaps we should be dealing with the PATRIOT Act or other matters of perhaps greater importance, let me try to put it on a broader scale.

The NFL is the role model for high school players. It is important to understand the extent of the risk these athletes take when they step on the field each week. And it is natural to center our attention on the professionals who fill our Sunday afternoons. But I think it is absolutely critical that in addition to focusing on the athletes who play in front of season ticket holders, that we remember the ones who play in front of their family, friends and peers on Friday nights.

The norms of the NFL, for better or worse, become the norms of high school football players. While contact and collision are inherent to the game, so too is a certain code that comes to the game that you go back to the huddle no matter how badly you are hurt, that you play no matter how badly you are hurt, that full contact drills all the time are okay, that you don't need water in a sufficient basis when you prepare. So what I guess I am getting to here is whatever we address and deal with the NFL goes beyond the concerns that we have with NFL players. It goes to those young people who play on Friday nights throughout our country. And while we can't do everything to change the dangerous nature of the game, we want to ensure that the NFL is doing everything in its power not only to provide for the well-being of its players, but to

set the right example for the millions of high school football players who follow their lead. Very, very few of them will become NFL players. But they still can be hurt and still can have long-lasting injuries as a result of their play and what they follow on Sunday afternoons. So I hope that one of the benefits of today's discussion is that it serves as a launching point to broaden the discussion on the precautions that can be taken to increase player safety at all levels. Thank you.

Mr. CONYERS. Thank you. Darrell Issa of California.

Mr. ISSA. Thank you, Mr. Chairman. And as a Member both of this Committee and the committee on steroids next door, I want to thank you for taking up this issue. I believe that when Government Oversight and Reform began looking at steroids with a bent toward a union negotiation that had failed, I believe that we didn't realize at that time that we could be as successful as we were in getting professional baseball to get steroids out, to have testing, and for that to fall down into college and high school ball, where today I believe that we have done a better job of eliminating that on our young athletes.

I believe that at its best, that is what we are going to do here. We are going to cause the ongoing union negotiations to focus on prevention, on dealing with changes in officiating, and we are obviously going to see behind closed doors the NFL deal with the question of how much do you pay up front and how much do you hold back for the long-term care of athletes. I believe that it is appropriate that we not judge those negotiations, because ultimately there is only so many dollars, and those dollars have to be allocated by a form of negotiation in which we are not participants. But when it comes to changes in the tolerance at professional and collegiate level of, if you will, head butting and other techniques that are growing and growing in their use, and as a result, leading to unnecessary head injuries, I think your leadership will be long appreciated for the fact that if we make it an issue here in Congress, it becomes an issue at the bargaining table. It ultimately will make a difference in the next USC-Notre Dame game, which means a lot to my colleague, and I am sure to all of us. I thank you and yield back.

Mr. CONYERS. Thank you very much, Mr. Issa. The last one on our side is Hank Johnson. Last one on the other side is Bob Goodlatte. Hank Johnson of Atlanta, Georgia.

Mr. JOHNSON. Thank you, Mr. Chairman, for holding this important hearing. I am glad this Committee is taking the opportunity to look at how football head injuries have the potential to affect one's quality of life. Today we will hear testimony from several witnesses who will discuss the necessity of independent research as well as the importance of incorporating any findings linking concussions and cognitive damage into preventive practices. Failing to have research that is independent could easily mislead the public into underestimating the serious impact of football head injuries.

In the long run, the old mantra of perseverance has the dangerous trickle-down effect of influencing over a million children who play high school football and the thousands who are injured every year. "Walking off the pain," as it is called, in an NFL game turns into "walking it off" in a Little League game, as young chil-

dren are, often encouraged by parents and coaches, attempt to imitate what they view as the noble behavior of their football heroes and gladiators. This behavior is clearly dangerous. And a refusal to recognize and respond to this danger is reckless and irresponsible.

Not only are the direct impacts of these head injuries dangerous, the trickle-down effects on high school and college players are very real and can be fatal, as we will hear today. I look forward to hearing the witnesses' testimony on this very important and urgent necessity to conduct an independent study on the cognitive impact of football head injuries and the legal ramifications of this brain damage. I thank the Chairman again for allowing me to make an opening and yield back the balance of my time.

Mr. CONYERS. Thank you, Mr. Johnson. A senior Member of the Judiciary Committee from Virginia, Bob Goodlatte.

Mr. GOODLATTE. Mr. Chairman, thank you for holding this hearing. I want to take the opportunity to welcome Tiki Barber, a great star of the New York Giants, now retired, who hails from my hometown of Roanoke, Virginia, and who will be testifying on the second panel, I believe, and can share a lot with us. He and his brother Ronde not only were great stars in the NFL, but also at the University of Virginia, and prior to that in the City of Roanoke in football played there, in high school.

So they can share this perspective with us at each level of competition. I also want to note the great work that he has done in promoting football and recreation and athletics in general. He and his brother have sponsored camps and other activities, and I have seen firsthand their great passion for our young people.

I also want to associate myself with the remarks of the gentleman from California and as well the Ranking Member. I share the concern about some of the practices that take place in football, and I think this is a great opportunity for us to learn more and to shine a spotlight on this issue. But I also associate myself with the remarks of Mr. Smith in saying that while we do want to pay close attention to what is going on here, I do not think the Congress should inject itself into the negotiations between the NFL and its players. Nor do I think that, as some have proposed here in the Congress, the Congress should engage in legislation that would allow or prohibit certain types of plays from taking place in high school or college or major league athletics.

Quite frankly, that is something that should be left to other people who are in better places and better positions around the country to make those decisions. And we here, the amateur quarterbacks on the House Judiciary Committee, should not take up that kind of micromanagement of American athletics. So I thank you, Mr. Chairman, for having this hearing today and allowing us to learn more about this issue.

Mr. CONYERS. Of course, we would never do anything like that. We have a distinguished Member of Congress, the founder and chair of the Congressional Brain Injury Task Force, Bill Pascrell. He has been at all our hearings. He sometimes thinks he is a Member of the Judiciary Committee. And we would like him to begin this discussion today. We welcome you back again to the Committee, Mr. Pascrell. All other Members that have an opening

statement, we will take it into the record. And we welcome you again before us.

TESTIMONY OF THE HONORABLE BILL PASCRELL, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEW JERSEY

Mr. PASCRELL. Thank you, Chairman Conyers and Ranking Member Smith, Members of the Committee, for having me here to speak on a very important topic of brain injury. It has become part of my life, literally.

Mr. Chairman, you have done a great job in bringing together a wide array of experts to discuss what can be a difficult and very controversial topic. These wounds may be invisible, but the consequences are very real. You have taken a stand to ensure that these consequences are addressed. As cofounder and co-chair of the Congressional Brain Injury Task Force, which is comprised of over 130 Congressional Members from both sides of the aisle, since its founding in 2001, it has been the task force mission to expand the understanding and public awareness of brain injury. Mr. Chairman, Mr. Ranking Member, educating members and the general population has been the most difficult effort of this task force. In recent years, the task force has taken a greater focus on brain injuries that have become the signature injury of the Iraq and Afghanistan war.

It is estimated that as many as 20 percent of soldiers returning from Iraq and Afghanistan have sustained a brain injury. The brain injuries of our soldiers have spurred Congress to make unprecedented investments in brain injury research, research that will benefit soldiers and civilians alike for years to come. And we have done this in a bipartisan fashion. The same way that we have gained greater understanding in research from the brain injuries from our soldiers, we should also take this opportunity to learn from the injuries of professional athletes.

In recent months, the task force has placed considerable attention on the issue of so-called mild brain injuries, specifically on concussions, which affect everyone from our soldiers in the battlefield to our children who play on various sports fields. In fact, the task force held a panel discussion that featured two of your witnesses today, Dr. Tucker, who is the team physician of the Baltimore Ravens, Mr. Nowinski, who is director for the Center for the Study of Traumatic Encephalopathy. These discussions and the growing number of studies, like the one commissioned by the National Football League, open our eyes to the implications of head injuries. Unfortunately, these consequences hit close to home. On October the 16th, 2008, Ryne Dougherty, a 16-year-old from Montclair, New Jersey, tragically died from a brain hemorrhage after returning to play football without fully recovering from a concussion sustained earlier in the season. I hope you understand what I am laying before this Committee.

In the later panel, you will hear the story of the untimely death of another young athlete, Will Benson. Please listen carefully so that we can work together and do something about preventing these things from happening. These stories are not unique to these young men. According to the Centers for Disease Control and Pre-

vention, as many as 3.8 million concussions related to sports and recreation are estimated to occur each year. After sustaining one concussion, an athlete becomes as much as four to six times more likely to sustain a second concussion. I also want to point out that recent studies show that girls may be at higher risk for concussions and face longer recovery times. Clearly, this is a problem that can impact all children.

In fact, Mr. Chairman, it is startling to see the numbers within a sport that we usually don't associate with problems of brain injury, soccer. And I have never seen a soccer game with anybody wearing any kind of protective head gear. I want to point out that recent studies show that girls may be at higher risk. I repeat that because study after study shows this. This is not something that is picked off a shelf. These are scientific studies. A recent study from the Center for Injury Research and Policy at Nationwide Children's Hospital in Columbus, Ohio, also found that as many as 41 percent of concussed high school athletes may be returning to play too soon.

And I would suspect that when we look into this further, when the NFL does its studies, that that will be the centerpiece of whatever we are going to do in the future. Many colleges and professional athletic associations, including the NFL, have all adopted guidelines for the management of concussions.

However, much of this information has not made its way to our local middle schools or high schools. I think that is imperative. This is serious business when you see how many of these concussions are taking place and how many children are in jeopardy of losing their lives. In response to the growing problem, last November I introduced the Concussion Treatment and Care Tools Act, better known as the ConTACT Act, with Todd Platts, who is the leading Republican in the task force. He is co-chair with me. Early in 2010, we expect that this bill will be heard. The ConTACT Act is designed to provide our schools and coaches with the tools they need to ensure that student athletes receive the proper care for concussions regardless of the sport that they play. Because varied and conflicting concussion management guidelines have caused confusion, the ConTACT Act provides for the establishment of a consensus set of guidelines that work for schools by bringing together a wide range of experts.

This bill also incentivizes the adoption of guidelines by schools to ensure that student athletes receive the proper care and are given adequate time to recuperate before they are returned to play. Need I say that it doesn't matter how young or how old you are, or what sport you play, or whether you play professional football, this should be a guiding principle of our research. In 2006, I worked with the Brain Injury Association of New Jersey to provide grants to New Jersey schools for the purchase of these technologies that are available. The ConTACT Act provides funds for the adoption of these technologies in our Nation's middle and high schools. If we are seeking the kinds of tangible long-term consequences of brain injuries as revealed by recent studies of NFL players, you have state of the art equipment and access to the best care available, then we have to consider what this means for our young athletes. Because damage to a maturing brain can be catastrophic, it is even

more important to ensure that we understand these consequences and that the proper care is provided to young athletes. I am happy to report this morning, and I just received it, that both the National Football League and the National Football League Players Association have endorsed the ConTACT Act. The letter is before me if anyone cares to read it.

Mr. CONYERS. We will accept it into the record.

[The information referred to follows:]

NATIONAL FOOTBALL LEAGUE

October 27, 2009

The Honorable Bill Pascrell
United States House of Representatives
2464 Rayburn House Office Building
Washington, DC 20515

Dear Congressman Pascrell:

On behalf of the National Football League, I would like to commend you on your efforts regarding Mild Traumatic Brain Injuries (MTBI). Your efforts to raise awareness to the issue, especially with regard to student athletes, through the Congressional Brain Injury Task Force, will help parents, teachers and coaches make youth sports safer.

We are also concerned about every athlete who plays our game. Over the past 15 years, the NFL has made significant investments in medical and biomechanical research on MTBI. All of that information has been made public, subjected to thorough and on-going peer review, and published in leading journals. We have used this information to change our playing rules to give greater protection to players, have shared it with helmet manufacturers and testing agencies, and have expanded educational efforts with both players and team medical staffs.

We have also taken the lead in sharing what we know about safety with colleges, high schools and wherever youth football is played. We have worked with the Centers for Disease Control to prepare and distribute educational materials about the treatment of head injuries for coaches, parents and athletes. These materials are and can be used wherever young people are at risk for concussions. We educate youth coaches about concussions through our endowment for USA Football, the leading, independent, non-profit youth football organization in the country. That organization's website—www.USAFootball.com—contains a wealth of health and safety guidelines and advice for coaches, parents and children. We are also working with USA Football on developing a certification program for youth and high school coaches to make the game as safe as possible. In addition, we distribute a wide range of coaching material at the high school and youth levels at our annual high school coaches summit in Ohio each summer and around the country in an effort to promote safe play.

At your request, we have reviewed H.R. 1347, "The Concussion Treatment and Care Tools Act" or "The ConTACT Act". We believe your goals in this legislation, to set model concussion management guidelines and provide grants for the dissemination of those guidelines, would add significantly to public understanding of these injuries. As your bill states, much is not well-understood about concussion and reliable data does not exist on the incidence of concussions. We at the NFL are proud of the work we are doing to answer some of these

questions. Your legislation would bring even more attention to this medical issue, particularly among younger athletes.

We are proud to endorse H.R. 1347 and look forward to working with you to gain its passage.

Sincerely,

ROGER GOODELL

Mr. PASCRELL. Thank you, Mr. Chairman. If we are encouraging young people, I will be closing, to be healthy athletes who embrace

ideas like teamwork and doing their best, then this Congress must do everything it can to protect them as they participate in sports. That is what we call fair play. It is my hope that this hearing will generate a national conversation, spur innovation in equipment, lead to action regarding brain injury and the implications that these findings have for athletes of all ages, male and female in all sports. I thank you again, Mr. Chairman and Mr. Ranking Member, for holding this important hearing, and I would gladly answer any questions if there are any.

Mr. CONYERS. There are plenty, but we are not going to go into it today. But we do welcome your coming with us again and the work that you and your caucus is doing in this regard. So we thank you so much, Bill Pascrell——

Mr. PASCRELL. Thank you, Mr. Chairman.

Mr. CONYERS [continuing]. For kicking us off.

[The prepared statement of Mr. Pascrell follows:]

PREPARED STATEMENT OF THE HONORABLE BILL PASCRELL, JR.,
A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEW JERSEY

Submitted Testimony of
Congressman Bill Pascrell, Jr. (NJ-08)
Co-Chair, Congressional Brain Injury Task Force

Thank you, Chairman Conyers, Ranking Member Smith, and members of the Committee for having me here to speak about this important topic. Mr. Chairman, you've done a great job in bringing together a wide array of experts to discuss what can be a difficult and controversial topic. These wounds may be invisible, but the consequences are very real. You have taken a stand to ensure that these consequences are addressed.

I am the co-founder and co-chair of the Congressional Brain Injury Task Force, which is comprised of over 130 Congressional members. Since its founding in 2001, it has been the Task Force's mission to expand the understanding and public awareness of brain injury.

In recent years, the Task Force has taken a greater focus on brain injuries that have become the "signature injury" of the conflicts in Iraq and Afghanistan. It is estimated that as many as 20 percent of soldiers returning from Iraq and Afghanistan have sustained a brain injury. The brain injuries of our soldiers have spurred Congress to make unprecedented investments in brain injury research—research that will benefit soldiers and civilians alike for years to come. The same way that we have gained greater understanding and research from the brain injuries of our soldiers, we should also take this opportunity to learn from the injuries of professional athletes.

In recent months, the Task Force has placed considerable attention on the issue of so-called "mild" brain injuries—specifically on concussions, which affect everyone from our soldiers on the battlefield to our children who play on the sports fields. In fact, the Task Force held a panel discussion on this very issue just this March as part of our annual Brain Injury Awareness Day.

These discussions and the growing number of studies like the one commissioned by the National Football League open our eyes to the implications of head injuries. Unfortunately, these consequences hit close to home.

On October 16, 2008, Ryne Dougherty, a 16-year-old from Montclair, New Jersey, tragically died from a brain hemorrhage after returning to play football without fully recovering from a

concussion sustained earlier in the season. I know in the later panel, you will hear the story of the untimely death of another young athlete Will Benson.

These stories are not unique to these young men. According to the Centers for Disease Control and Prevention (CDC), as many as 3.8 million concussions related to sports and recreation are estimated to occur each year. I also want to point out that recent studies show that girls may be at higher risk for concussions and face longer recovery times. Clearly this is a problem that can impact all our children.

After sustaining one concussion, an athlete becomes as much as four to six times more likely to sustain a second concussion, and if an athlete is allowed to return to play without fully recovering from a concussion, they may face tragic consequences. A recent study from the Center for Injury Research and Policy at Nationwide Children's Hospital in Columbus, Ohio also found that as many as 41 percent of concussed high school athletes may be returning to play too soon.

Repeat concussions can result in cumulative neurological damage and have been shown to significantly worsen long-term outcomes including depression and other psychological problems. In rare cases, a repeat concussion can trigger 'second impact syndrome' which can be marked by the swelling of the brain, permanent brain damage, or even death.

Fortunately, repeat concussions and 'second impact syndrome' are highly preventable if sensible guidelines and procedures are adopted. Many college and professional athletic associations—including the National Collegiate Athlete Association, the National Football League, and the National Hockey League—and other national provider organizations—including the American Academy of Neurology, the American Academy of Family Physicians, the National Athletic Trainers' Association, and the Brain Injury Association of American—have all adopted guidelines for the management of concussions. Despite education efforts by CDC, however, much of this information has not made its way to our local middle schools and high schools.

In response to this growing problem, last November, I introduced the Concussion Treatment and Care Tools Act—or the ConTACT Act. The ConTACT Act is designed to provide our schools

and coaches with the tools needed to ensure that student athletes receive the proper care for concussions—regardless of the sport they play.

Because varied and conflicting concussion management guidelines have caused confusion, the ConTACT Act provides for the establishment of a consensus set of guidelines that work for schools by bringing together a wide range of experts. The ConTACT Act also incentivizes the adoption of these guidelines by schools to ensure that student athletes receive the proper care and are given adequate time to recuperate before returning to play.

The use of baseline and post-concussion testing technologies are common-place in professional and college sports. In 2006, I worked with the Brain Injury Association of New Jersey to provide grants to New Jersey schools for the purchase of these technologies. The ConTACT Act provides funds for the adoption of these technologies in our nation's middle and high schools. By providing coaches, athletes, and parents with the tools and information needed to identify and understand the signs, symptoms, and implications of concussions, we can help to prevent needless deaths and countless injuries.

Mr. Chairman, if we're seeing the kinds of tangible, long-term consequences of brain injuries as revealed by recent studies of NFL players—who have state-of-the-art equipment and access to the best care available—then we have to consider what this means for our young athletes. Because damage to a maturing brain can be catastrophic, it is even more important to ensure that we understand these consequences and that the proper care is provided to young athletes.

If we are to encourage young people to be healthy athletes who embrace ideas like teamwork and doing their best, then this Congress must do everything it can to protect them as they participate in sports. That is what we call "fair play." It is my hope that hearings like this one will generate a national conversation, spur innovation in equipment, and lead to action regarding brain injury and the implications that these findings have for athletes of all ages—male and female—in all sports.

Thank you again, Mr. Chairman, for holding this important hearing.

Pascrell Testimony Page 3

Mr. CONYERS. The first panel consists of Merrill Hoge, George Martin, Dr. David Weir, Dr. Robert Cantu, Dr. Andrew Tucker, Dr. Gay Culverhouse, Mr. DeMaurice Smith, and the Commissioner of the National Football League, Roger Goodell.

We welcome you all, urge you to take your seats. The current Commissioner of the National Football League is also the son of Senator Charles Goodell, who was both a Member of Congress and a United States Senator. Roger Goodell played football himself in college, and he has been with the National Football League for many years. We appreciate his good work, his cooperative spirit that he brings to these hearings. And we will accept all of your written testimony into the record and invite you—we welcome you all and invite you, Mr. Goodell, Commissioner, to begin our discussion.

TESTIMONY OF ROGER GOODELL, COMMISSIONER, NATIONAL FOOTBALL LEAGUE

Mr. GOODELL. Thank you, Mr. Chairman. Ranking Member Smith, Members of the Committee, I submitted a full statement and would ask it be included in your record. Since becoming Commissioner of the National Football League a little more than 3 years, I can think of no issue to which I have devoted more time and attention than the well-being of NFL players, and particularly our retired players. I want to review what we have done in the past 3 years and make clear that we are not finished. Our initiatives generally for retired players include the following: Since I became Commissioner, we have made a wide range of improvements in both the benefits and the administration of the disability plan. We have doubled the minimum benefit and lengthened the time within which players can apply for benefits. We have retained a new independent medical director. We have reduced red tape. We have simplified the process for applicants and their families and sped disability determinations. Each of these changes was made at our initiative. As we proceed with the current round of collective bargaining, we look forward to making further improvements in this plan. Apart from the disability plan in 2006, we created the 88 Plan, which provides up to 88,000 per year for any former player and his family who has dementia or Alzheimer's. Those players do not need to show that their condition is related to football. We have developed and funded new medical benefits for retirees, including programs for joint replacement surgery, cardiovascular and prostate cancer screening, spinal care, assisted living arrangements, and a discount card for prescription drugs. Retirees are eligible for these benefits at no cost to themselves. In each successive collective bargaining agreement since 1993, we have increased pension benefits and done so retroactively. We want that to continue.

And as we negotiate with the NFLPA for a new agreement, the clubs have again identified retired player pensions as a specific priority, and look forward to discussing our proposals with the union. Through these and other benefits, retired players will receive more than $100 million in 2009. And I have committed to our retirees, and I will repeat that commitment today, that we will not reduce or eliminate funding for these benefits based on the status of our collective bargaining agreement, and we will continue to accept new applications for disability or 88 Plan benefits.

We have also tried to understand the needs of our retirees and their families. I have met with hundreds of them across the country. We have commissioned the University of Michigan phone sur-

vey that Dr. Weir will discuss. We learned a good deal from the report, and are actively following up with the 56 players who report memory problems. I know that a specific matter of interest is concussions and their effects. We know that concussions are a serious matter, and that they will require special attention and treatment. And in this area, I have been clear. Medical considerations must always come first.

Decisions regarding treatment of players with concussions and when they can resume play must be made by doctors and doctors alone. We are changing the culture of our game for the better. Again, it is important to look at what we have done. In addition to research that has led to better equipment, we have made numerous rule changes to sharply limit the kinds of hits that lead to concussions. We have also emphasized proper care and education. Prior to 2007, we took a number of steps, with the active participation of the NFLPA and its medical director.

We held an open medical conference on concussions. Many of the doctors here today participated and shared their findings. We developed new educational materials for players and their families, and the doctors developed new guidelines for management of concussions that have reinforced a clear trend toward increasingly conservative care. The NFLPA and I jointly communicated these initiatives to all players, owners, head coaches, doctors, and trainers, and they were of course widely publicized. So we welcome the union's interest in this subject and look forward to continued collaboration. Just 2 weeks ago I met with Dr. Cantu in Boston. Based on that discussion, I have asked John Madden, who is now a special adviser to me, to work with a group of coaches to identify new practice techniques, or practice techniques that have been used in the past, that could reduce the risk of head trauma outside of the games themselves.

We must continue to learn from and base our decisions on science, but we cannot stand by while research continues. So we will continue to have a singular focus on player safety and do all we can through equipment changes, rules, education, and medical care to make the game as safe as possible. We will also support all manner of ongoing research. One other outcome of my discussion with Dr. Cantu is I expect shortly to be able to announce the NFL support for ongoing research into CTE. We recognize that our example extends to young athletes who play football. Accordingly, through USAFootball we have distributed material on concussions developed by HHS and the CDC to 9,000 youth programs across the country. And the USAFootball Web site, visited by as many as 200,000 people each month, contains a wealth of information on concussions and other health and safety issues. We will continue to do more to disseminate information and to emphasize safe and fair play.

In conclusion, Mr. Chairman, our goal will continue to be to make our game as safe as possible for those who love to play it, and to give our retirees the support and respect they deserve. Thank you.

Mr. CONYERS. Thank you very much, Mr. Commissioner.

[The prepared statement of Mr. Goodell follows:]

PREPARED STATEMENT OF ROGER GOODELL

Testimony of

Roger Goodell
Commissioner, National Football League

Before the
House Committee on the Judiciary

"Legal Issues Relating to Football Head Injuries"

October 28, 2009

Chairman Conyers, Ranking Member Smith, Members of the Committee:

My name is Roger Goodell. I am the Commissioner of the National Football League and have served in that capacity for just over three years. I am pleased to be here today to discuss an area of great importance to the league and to me personally – the health and welfare of all members of the NFL family, particularly our retired players.

Since becoming Commissioner, I can think of no single issue to which I have devoted as much time and attention. I believe we have an obligation to these men who have contributed so much to our game. I have personally travelled around the country to meet with groups of retired players and their families. I have met with many of them individually or in small groups, and have had discussions with advocates of retired players. I appointed one of our senior executives as my Special Advisor on retired player issues shortly after I became Commissioner. Twice this year, representatives of the NFL Alumni Association and other retired player groups have met in formal league meetings with team owners. These discussions helped us as a league better understand the challenges - including health issues-- facing our alumni and led to specific actions to assist them.

While this hearing is focused on a specific health issue related to retired players, it is important to discuss our overall commitment to the safety and welfare of the football's most valuable assets-- those individuals who play our sport. Lessons of teamwork, fairness, perseverance and self confidence are taught in football. Lives often are shaped by individuals who coach or play alongside young people on the field. Thousands of outstanding educators, businessmen, public officials, and even former United States Presidents give credit to football experiences during their youth for their professional success today.

We are fortunate to be the most popular spectator sport in America. In addition to our millions of fans, more than three million youngsters aged 6-14 play tackle football each year; more than one million high school players also do so and nearly seventy five thousand collegiate

players as well. We must act in their best interests even if these young men never play professional football.

We know that the playing rules changes the NFL makes in the interest of safety will be copied at the lower levels of play. We realize that the millions of dollars we spend on prevention, treatment and research of injuries will pay off for current and future generations of players both in football and other sports. We have an Injury & Safety Panel which includes outstanding NFL team doctors as well as outside medical experts that reports directly to me on matters ranging from field turf to the latest information on knee and ankle injuries. We view this as an overall sports policy matter and this is why I personally have spent the time I have on this issue and why we as a league devote the resources we do to health and safety matters.

During my tenure as NFL Commissioner, I have made it a personal priority to assist retired players and help identify not only those in need but to determine what those needs are. To do this, the league has undertaken initiatives in several key areas:

First, pension benefits. In each successive Collective Bargaining Agreement since 1993, we have increased pension benefits and have done so retroactively. Since 1993 we have more than tripled the monthly pension benefit for the oldest of our eligible retirees, and the monthly benefit for a player who retired in 1993 has gone up by more than 75 percent. Normal NFL retirement age is 55; if the player were to take his pension at age 62 or 65, the benefit will be even greater—as much as double. We have reduced the time required for a player to vest. And as we negotiate for a successor CBA, we have again identified retired player pensions as a priority and look forward to discussing with the Players Association our specific proposals to improve those retiree pensions.

Second, disability benefits. In the past two years, we have made numerous improvements to the administration of our disability plan as well as to the actual benefits themselves. We have doubled the minimum benefit paid under the plan. We have retained a new, independent medical director to ensure that the standards for evaluating disability claims are clear, consistent and reflect current medical science. We have accepted determinations of disability made by the Social Security Administration without requiring independent medical review and have reached out to disabled former players and given a second opportunity to apply for benefits in prior cases. We have made many other administrative reforms to cut down on red tape, minimize the burdens on applicants and their families, and speed disability determinations. Based on these reforms, I believe our disability plan is much improved from three years ago. It is a subject of ongoing discussions with the NFLPA which I am confident will result in still further improvements. I am not so naïve as to believe that we will satisfy all of our critics, but I believe a fair-minded evaluation of our actions over the last two years will confirm my judgment.

Third, medical benefits. We have implemented a variety of additional programs to address medical needs of our retired players. The owners also made a $10 million grant in 2007 to a new Player Care Foundation to fund research and help those needy retired players with critical medical needs. Those additional programs include screening retirees for cardiovascular risk and prostate cancer, and initiatives that provide joint replacement surgery and rehabilitation services, spinal care, and assisted living arrangements. In each case, we have identified nationally-recognized experts, partnered with leading medical and rehabilitative institutions, and made services available to retired players on a preferential basis. Large numbers of retired players have taken advantage of one or more of these programs. Hall of Famer Michael Haynes

is one of several players who learned he had early prostate cancer through screening provided by the NFL. We have undertaken an aggressive outreach campaign to bring the services to as many retirees as possible. We have also offered all retired players – again, at no cost to them – a prescription drug card that allows them to obtain medication at substantial discounts. We have set up a special website (www.nflplayercare.com) for retired players and their families that lists information about these benefits and have conducted other forms of outreach as well.

Let me turn now to a specific area of interest, which is concussions and their effects. We know that concussions occur in football and other sports and that they can have serious effects if not properly treated. In the past 15 years, the NFL has made significant investments in medical and biomechanical research. All of that information has been made public, subjected to thorough and on-going peer review, published in leading journals, and distributed to the NFLPA and their medical consultants. We have been open and transparent, and have invited dialogue throughout the medical community. We are committed to following what the science determines and what is right for our players.

One result of our work is that the Department of Defense contacted us and we had a joint conference here in Washington last year with leading DoD experts and our best medical researchers and doctors. The military wanted among other issues to discuss our medical protocol on head injuries and they referenced similar issues on the battlefield. We continue to work with them on these issues. For example, Colonel Michael Jaffe, the Director of the Defense and Veterans Brain Injury Center, attended one of our recent MTBI committee meetings in New York.

My approach to this concussion issue in football has been simple and direct – medical considerations must always take priority over competitive considerations. We have established a toll-free hot-line for players if they believe they—or their teammates—are being pressured to return to the field before they are fully recovered from a concussion or other head injury. Consistent with that approach, and with our overall commitment to player safety, we have addressed the issue of concussions in numerous ways.

The first is research. Our commitment to researching, understanding, and addressing the health needs of our retired players is unwavering. This includes taking a leading role on the science surrounding concussions. We have invested more than $5 million in research on this one issue in the last 15 years. Our medical experts have met with most of the doctors here today, including Drs. McKee, Cantu and Bailes. I personally met with Dr. Cantu two weeks ago in Boston. We identified several areas where we could work together and I look forward to continuing those discussions. While Dr. Cantu and his colleagues can speak for themselves, and have not hesitated to criticize the NFL when they think appropriate, I believe there is also recognition by them that we are addressing the issue in a genuine way and that we are open to working with them and others to contribute to researching this important matter. A complete set of the published reports has been given to the committee. The research this decade has helped in the development of improved helmets. Our equipment managers meet with the various manufacturers each year to be trained in helpful pragmatic information right down to how to properly fit helmets. We require players to fully buckle their chinstraps to ensure that the helmet remains secure. And we look to NOCSAE, the independent testing organization, for the latest information on the protective qualities of helmets.

The second is playing rules. In recent years, we have modified our playing rules to sharply reduce contact to the head and neck, in addition to longstanding prohibitions against helmet to helmet contact. At our league meeting two weeks ago, we again reviewed with our clubs the way in which those rule changes have eliminated many unnecessary hits on quarterbacks, defenseless players, and linemen.

A third area is the treatment of concussions when they do occur. All return-to-play decisions are made by doctors and doctors only. The decision to return to the game is not made by coaches. Not by players. Not by teammates. If a player suffers a concussion and loses consciousness, he cannot return to the same game under any circumstances. That was not the rule as recently as 2006. Moreover, our doctors have developed guidelines that we believe are consistent with best medical practice. A player may not return to a game or practice unless he is fully asymptomatic both at rest and after exertion.

We in the NFL have pioneered the use of neuropsychological testing for players, and our players who experience concussions undergo follow-up neuropsychological tests and must return to their baseline score before being cleared to play. A review of the past six seasons shows that our doctors are managing this injury in an increasingly conservative way. For example, the number of players who are removed from play has significantly increased. The amount of time between the injury and the player's return to practice or play also has steadily increased and the number of players held out from play for a prolonged period has doubled. As research continues, and science advances, we can and will expect our medical team staffs to continue to address this issue in a conservative way, and one that is consistent with the best medical information.

The fourth is education. Our team medical staffs obviously spend a great deal of time on concussions. As one example, in 2007, we held an open scientific conference to which doctors and scientists from across the country were invited. The speakers at the conference included some doctors who, quite frankly, have been critical of the NFL. But I felt it was essential that their views be heard, and we required all team medical personnel to attend and hear what those doctors said. We also had leaders from the NFLPA at the conference, so that they too would hear the same information as our clubs. The NFLPA needs to be a big part of this education process going forward. Coming out of that conference, our doctors developed new return-to-play guidelines, and we undertook a more comprehensive effort to educate players and their families on concussions, the symptoms, and the need to communicate fully and openly with their team medical staffs. We will hold a second conference devoted to concussions following this season to review the most recent learning in the field and continue this process of education.

When the late Gene Upshaw was the NFLPA Executive Director, I began a Player Advisory Council of active players to discuss NFL matters important to them. Players such as Takeo Spikes, Drew Brees, Tony Richardson and Jeff Saturday participated. We discussed concussions several times with this group. They were adamant that they wanted discipline for those players who were causing concussions via helmet-to-helmet hits or other non-sanctioned on-the-field plays. Also, they asked for more information regarding the nature of concussions. As a result, we sent updated material on the subject to all players and their wives.

We also recognize that education does not stop with our athletes. The NFL Youth Football Fund has distributed more than $150 million to the development of our sport on the youth and high school level since it was started by our office and the NFLPA in 1998. Player safety and educational programs have received a large number of those grants. So, again, we

have taken the lead in sharing what we know about safety with colleges, high schools and wherever youth football is played. We also understand that the risks may differ for younger athletes. We have worked with the Centers for Disease Control to prepare and distribute CDC educational materials about the treatment of head injuries for coaches, parents and athletes. These materials are -- and can be -- used in all sports where young people are at risk for concussions.

We educate youth coaches about concussions through our endowment of USA Football, the leading, non-profit youth football organization in the country. That group's website—www.USAFootball.com—contains a wealth of health and safety guidelines as well as advice for coaches, parents and children. USA Football in affiliation with the National Federation of High Schools has developed a certification program for high school and youth coaches to make the game as safe as possible. I would recommend the certification program to all those involved with our sport at that level. This is one of the topics I discussed with Dr. Cantu earlier this month. In addition, we distribute at our annual NFL-USA Football high school coaches summit in Ohio each summer a wide range of coaching material to promote safe play.

Recently, a number of media stories have been published about a condition known as CTE – chronic traumatic encephalopathy. As you may hear from other witnesses today, this condition has been seen in the brains of several former NFL players, in athletes in other sports, and even in an athlete who was only 18 years old. How susceptible athletes and others are to this condition, and the precise causes and contributing factors, are issues for scientists and doctors to study and decide. It is fair to assume that head trauma may play a role. We therefore need to do all we can to protect the brain; hence, the increasingly conservative way in which this injury has been addressed by team medical staffs and players. Whatever its incidence, CTE is not limited to football players, but is instead a broader public health issue that needs to be recognized as such. For our part, we want to encourage and contribute to that research and I expect in the next several weeks to be able to announce new partnerships between the NFL and organizations researching CTE.

Beyond CTE, we want to support research addressing other long-term health issues dealing with concussions. All of that research will continue to be published and fully disseminated within the medical and scientific communities. In the meantime, we have not waited for the results of research to take action to assist retired players (and their families) who are in need due to memory loss and related illness. The most well-known example of that outreach to our players is the 88 Plan (named after Baltimore Colts Hall of Famer John Mackey) to help our players struggling with dementia, Alzheimer's, and Parkinson's, regardless of the cause of the disease. The 88 Plan contributes up to $88,000 annually for the extraordinary care these men need. The payment requires no proof of football-related injury. Instead, if one of our players tragically joins the millions of Americans in receiving a diagnosis of dementia or Alzheimer's he will receive the assistance – regardless of family history or other possible non-football links to these diseases. While we are saddened that more than 100 members of the NFL family have needed this assistance, we are pleased to help them in their time of need. We are prepared to help any of those individuals—and their families—who need medical assistance.

Indeed, I understand it is one of the NFL's own commissioned surveys that served as an impetus for today's hearing and so I would like to discuss that survey and put it into context from my perspective. The survey—initiated by our office and paid for by the NFL Player Care Foundation-- was completed by researchers at the University of Michigan and grew from a desire on our part to better understand the condition and needs of our retirees. We have had more than

21,000 players participate in an NFL game over the years. This phone survey of 1,070 alumni conducted in late 2008 provided us with essential data to aid in our future efforts.

We discovered much good news. For example, our former players are better insured, have higher incomes, are more attached to their communities and have longer marriages than the population at large. We also learned that they have lower rates of diabetes, cardiovascular disease and obesity than their contemporaries. We added important data to what we already knew about increased reports of arthritis and joint pain. And, we saw 56 cases of self-reported dementia, Alzheimer's and other memory-related issues.

While this was a telephone survey and not a true medical diagnosis, we share the views of the Michigan researchers that the number of retired players reporting memory related problems is a concern that needed further research. I understand that Dr. David Weir, the lead researcher at the University of Michigan, will testify later today and can address what he and his colleagues found and what they did not find. Nonetheless, and consistent with obligations of confidentiality, we have directed Dr. Weir to contact in a confidential manner those 56 former players and their families who reported memory problems to see if they are receiving 88 Plan funding and offer them the opportunity to have follow up medical work done at our expense. That process has already begun.

More can be done for the retired players. As you know, we are currently negotiating with the Players Association an extension to our collective bargaining agreement, which expires in 2011. If we enter the 2010 season without a salary cap, the NFL is not required under the CBA to fund certain benefits for retirees. Nonetheless, I gave my commitment in writing last August to our retired players that there will be no change in the funding of pensions or disability benefits, including the 88 Plan. We also will continue to accept new applications for assistance regardless of the direction that CBA negotiations take us.

In conclusion, Mr. Chairman, we are proud of the affirmative steps we have taken in helping our retired players in need and we know, in turn, that many of them appreciate what has been done for them or a needy ex-teammate. We have not waited on medical science or political prodding to improve the care our alumni receive. You and our NFL retirees have my assurance that we will continue to do all that we can to make certain that they are treated with the care and respect they deserve.

Thank you and I look forward to taking your questions.

10/28/2009

Mr. CONYERS. Our next witness is Attorney DeMaurice Smith, who did his thing in varsity track and field, went on to law school, University of Virginia Law School, worked in the U.S. Attorney's office, served under Eric Holder when he was a Deputy Attorney General, as a trial lawyer, was President of the Assistant United States Attorneys Association, and has received many awards. And we welcome you. We have your statement. And we encourage you to expound on it in the time that you have.

TESTIMONY OF DeMAURICE SMITH, EXECUTIVE DIRECTOR, NFL PLAYERS ASSOCIATION

Mr. SMITH. Yes, sir. Good morning, Mr. Chairman, Ranking Member Smith, Members of Congress, Congresswoman Sánchez, and others. Thank you very much for the opportunity to testify this morning. I would also like to take the time to welcome and thank Ms. Sylvia Mackey, wife of John Mackey, as well as Mr. Wood. Other former players are also in attendance. Mr. Brent Boyd and I welcome each and every one of them, and thank them for their attendance today. As executive director, my number one priority is to protect those who play and have played this game. There is no interest greater than their health and their safety. Let me say this again. The safety of our players is paramount. Mr. Chairman, you and this Committee deserve immense credit and appreciation for consistently bringing this issue of concussions, brain trauma, health and safety in the sport of football to the forefront. This Committee and this hearing will be a turning point on this issue. My hope is that this day will serve as a marker denoting the day that we are committing ourselves to finding the right answer. It will influence not only this game at the professional level, but the one that so many of us love for our players in college, high school, and in youth football.

I have one simple declaration on behalf of those who play and those who played this game. We are committed to getting the right answers, to work with everyone who has the goal of protecting our players, and to serve as a model for football at every level. Given that commitment, I acknowledge that the players union in the past has not done its best. We will do better. To men like John Mackey, to men like Brent Boyd, to men like Mr. Wood, and to families of Mr. Mike Webster and to Andre Waters, and to those organizations like the Gridiron Greats that stand with us, I commit and we commit this as our primary mission. We will not fail them. I will not fail them. Both myself and the current retired players of the National Football League are committed to getting this answer right. I was elected by the board of player reps in March of this year. Since that time, we have taken the following steps to address this issue. In May of 2009, we created the NFL Players Concussion and Traumatic Brain Injury Committee to address two critical issues, the diagnosis, treatment, and prevention of concussions and TBI in active players, and second, the long-term cumulative effects of TBI in NFL players as patients, to analyze and study this issue of NFL players as patients, and how these effects can be reduced or eliminated.

This Committee, funded by the players, will act as a superconductor of current and future studies, and is charged with one

overarching goal, to get the answer right. Two weeks ago I met with all of the chapter presidents and steering committee members who represent the retired players of the National Football League. This 40-person Congress of former players that represent and make up the NFL Retired Players Association is an organization with over 25 years of history. At that meeting, they all embraced the creation of this committee and joined our call to have the National Football League release all aggregate medical information that has been collected over the years to benefit both current and retired players.

Third, several players have dedicated their bodies to medical science in the effort to provide researchers with the best information to aid those who will play this game in the future. This body of retired players also had several players who are willing to do the same thing. Not only to help the players who are playing this game today, but as they have done in the past, to stand up for the people who will play this game tomorrow. Because they know that it will be their sons, it will be their daughters who are playing sports that will benefit from this research. For the first time ever, the Players Association medical director, Dr. Thom Mayer, is present at every meeting, including collective bargaining meetings that deal with player health and safety. He will chair the Players Traumatic Brain Injury Committee.

Finally, Mr. Chairman, to everyone here, to the retired players, to those who are watching us across the country, the players of the National Football League will not bargain for medical care. We will not bargain for health and safety. We will not bargain for basic provisions of the law as patients. We will continue to work with the league, but medical care is not and will never be just a collective bargaining issue. While all players understand that professional football is a violent game, we must do our best to keep them informed of the game's potential consequences. Yes, it is true that professional football players are the best, most well conditioned athletes in the world, but even those blessed with tremendous athletic gifts are vulnerable to severe injuries. We must know and embrace all of the medical data to prevent, treat, and manage the long-lasting effects of these injuries. Mr. Chairman, I welcome any questions, am prepared to submit any other information that you may request, and am happy to be here today.

[The prepared statement of Mr. Smith follows:]

PREPARED STATEMENT OF DEMAURICE SMITH

TESTIMONY OF DEMAURICE SMITH

EXECUTIVE DIRECTOR, NATIONAL FOOTBALL LEAGUE PLAYERS ASSOCIATION

BEFORE THE COMMITTEE ON THE JUDICIARY

UNITED STATES HOUSE OF REPRESENTATIVES

OCTOBER 28, 2009

Good Morning Chairman Conyers, Ranking Member Smith and Members of the Committee. My name is DeMaurice Smith and I represent the players, both current and former, of the National Football League.

As Executive Director, my number one priority is to protect those who play and have played this game. There is no interest greater than their health and safety. Let me say this again: Safety of the Players is Paramount.

Mr. Chairman, you and this Committee deserve immense credit and appreciation for consistently bringing this issue of concussions and brain trauma in the sport of football to the forefront. This Committee and this Hearing will be a turning point on this issue. My hope is that this day will serve as a marker denoting the day that we are committing ourselves to finding the right answer. It will influence not only this game at the professional level, but the one that so many of us love for our players in College, High School and Youth Football.

I have one simple declaration on behalf of those who play and those who played this game:

WE ARE COMMITTED TO GETTING THE RIGHT ANSWERS, TO WORK WITH EVERYONE WHO HAS THE GOAL OF PROTECTING OUR PLAYERS AND TO SERVE AS A MODEL FOR FOOTBALL AT EVERY LEVEL.

Given that commitment, I acknowledge that the Players Union in the past has not done its best in this area. We will do better.

To men like John Mackey and Brent Boyd and to families of Mike Webster and Andre Waters, and those organizations that stand with us, I commit and we commit to this as our mission. We will not fail them.

Both myself and the current and retired players of the National Football League are committed to getting this answer right. I was elected by the Board of Player Representatives in March of this year. Since that time we have taken the following bold and innovative steps to address this issue:

- In May 2009, we created the NFL Players Association Concussion and Traumatic Brain Injury (TBI) Committee, to address two critical issues: 1) the diagnosis, treatment and

prevention of concussions and TBI in active players; and 2) the long term, cumulative effects of isolated or repetitive TBI in NFL players as patients and how these effects can be reduced or eliminated. This Committee, funded by the players, will act as a "super-conductor" of current and future studies and is charged with one overarching goal: TO GET THE RIGHT ANSWER.

- Two weeks ago, I met with all of the Chapter Presidents and Steering Committee members who represent the Retired Players of the National Football League. This 40 person congress of former players that represent the NFL Retired Players Association, an organization with over 25 years of history, embraced the creation of the NFL Players TBI Committee and joined our call to have the NFL release all aggregate medical information that would aid current and retired players.
- Several players have dedicated their bodies to medical science in the effort to provide researchers with the best information and research to aid those who will play the game in the future.
- For the first time ever, the Players Association's Medical Director Dr. Thom Mayer is present at every meeting, including Collective Bargaining meetings that deal with player health and safety. He will chair the Players TBI Committee.
- Finally we, the players, will not bargain for medical care; we will not bargain for health and safety; and we will not bargain for basic provisions of the law as patients. We will continue to work with the League but medical care is not and will never be a Collective Bargaining issue.

While all players understand that professional football is a violent game, we must do our best to keep them informed of the game's potential consequences. Yes, it is true that professional football players are the best, most well-conditioned athletes in the world, but even those blessed with tremendous athletic gifts are vulnerable to severe injuries. Traumatic brain injuries represent some of the most severe injuries known to affect football players. Furthermore, the long-lasting effects of these injuries can be devastating.

Overview

The game of football is America's passion, as it is often discussed, analyzed and debated 24 hours a day, seven days a week and discussions focusing on the business of football are becoming increasingly popular – just ask anyone who participates in a fantasy league; however, the science of football is rarely discussed or scrutinized. Perhaps the catalysts for the current spotlight on the potential effects of traumatic brain injuries are the recent study conducted by the University of Michigan Institute for Social Research on former NFL players and an article in *GQ* entitled, "*Game Brain*". However, during the last five years, there were other significant articles by Alan Schwarz of the New York Times and Peter Keating of ESPN.

The University of Michigan Study (September 10, 2009) indicated that dementia, Alzheimer's disease and other memory-related diseases are 19 times more likely to afflict former NFL players ages

30-49 and 5 times more likely for ages 50 and older. This study did not administer cognitive tests or conduct neurological examinations, instead only asked whether the player had been diagnosed with "dementia, Alzheimer's disease or other memory-related disease".

This however, was not the first study on this issue. While this is the first NFL-accepted study that demonstrated a connection between on-field injury and post career mental illness, there have been studies over the last decade highlighting that fact. Unfortunately, the NFL has diminished those studies, urged the suppression of the findings and for years, moved slowly in an area where speed should have been the impetus. For example, in 2002, Dr. Bennet Omalu, a neuropathologist, studied the brains of several former NFL players and concluded that all suffered from chronic traumatic encephalopathy ("CTE"). Subsequently, Dr. Omalu wrote a paper entitled "Chronic Traumatic Encephalopathy in a National Football League Player" for submission to *Neurosurgery*, a medical journal; the paper was reviwed by several experts and published in July of 2005. NFL Drs. Casson, Pellman and Viano, all members of the NFL's Mild Traumatic Brain Injury (MTBI) Committee, wrote a letter to the editor, demanding a retraction of Dr. Omalu's paper. The paper was not ultimately retracted and, in fact, *Neurosurgery* later published a second paper by Dr. Omalu on the same topic.

Action

While there is greater cooperation between the NFL and the Players Association through the NFL's MTBI Committee, the players believe that it is important to have an objective Committee that is free from any appearance of conflict of interest. The players know that:

- The former Chairman of the NFL's MTBI Committee was a rheumatologist by training when he requested a retraction of the Neurosurgery paper by Dr. Omalu;
- The letter demanding the retraction of such paper, a copy of which I have here, described the study of former players' brains as "completely wrong"; and
- The NFL had a similar response regarding Dr. Bailes and Kevin Guskiewicz's study conducted by the University of North Carolina Center for the Study of Retired Athletes that concluded that players who had suffered multiple concussions were three times more likely to suffer from clinical depression. A member of the NFL's MTBI Committee, then chaired by Dr. Elliot Pellman, called that study "virtually worthless".

Between 2000 and 2008, there have been hundreds of studies highlighting this issue. I believe that the NFL MTBI Committee has reviewed many of them, but as we learn more about this issue, one thing becomes clear: the days of denigrating, suppressing, and ignoring the medical findings must come to an end. We need to share the right information, embrace the right researchers and collectively find the right answers.

Here is what we are committed to do:

First, through the Players' TBI Committee, we will objectively and honestly embrace all of the studies and evidence so that we can craft a roadmap that leads to preventative measures. There are 2 studies currently underway – the NFL MTBI study on retired players and their ongoing data on concussions and the UNC study. We will look to verify the scientific relevancy of these studies, provide any information that is necessary to ensure a successful review and carefully evaluate and disseminate any findings. We will also renew our request to the NFL to provide the injury data and analyses from the NFL for 2006, 2007 and 2008. We believe this information will not only improve our knowledge about this issue and these injuries sustained by our players, but assist us in developing safety initiatives. The NFL has long been privy to this information alone and hopefully, after repeated requests for the information, we will be rewarded with their compliance.

Second, we will use the Players Concussion and TBI Committee as a "superconductor" to commission, evaluate, follow and disseminate ongoing research. The Committee will be comprised of current and former NFL Players, TBI researchers and physicians with expertise in neurologic injuries. I have asked many of the doctors previously rejected by the NFL to serve on this Committee because they are scholars, respected by their peers and experts in their field. I am proud to say that the following doctors have agreed to join the players and me in this effort: neurosurgeons and/or neurologists: Drs. Bailes, Cantu, Watson and Ling; neuropathologists: Drs. Davies, McKee and Omalu; neuropsychiatrists: Drs. Liketsos and Wise; neuropsychologists: Drs. Lovell and Guskiewicz; and NCAA team physician, Dr. Bytomski. Elements to be addressed by our Committee include specific research into traumatic head injuries, the education and awareness of football players at all levels, diagnosis and management of such injuries, including sideline care in the event of a head trauma, preventive measures and scrutiny of the rules of football in an effort to increase the safety of the playing conditions.

Third, the Committee will work with the NFL to consistently review the procedures for the diagnoses of players and the decision about when a player who suffers a head trauma should return to play.

Fourth, we will seek to improve the coverage provided by the 88 Plan and aggressively reach out to our former players to assist them in any way we can. Currently, the 88 Plan only covers dementia. We should look to expand its coverage to a wider array of mental and psychologically debilitating conditions such as traumatic brain injury, severe depression and other neurological diseases.

Fifth, the NFL and the NFLPA need to become the leading voices to college, high school, and youth leagues about the issue and the steps that can be taken to minimize the risks of concussion and brain trauma. We can do this only if we have access to the information already collected by the NFL from our players. It is not too much to ask that the players, from whom this information is collected, benefit from the use of this information. I believe that while we are here to discuss traumatic brain injuries, the information collected by the NFL team owners could be valuable for researchers investigating a myriad of medical conditions such as arthritis, joint deterioration, Alzheimer's, aging, physical rehabilitation and recovery from injuries. We, along with our partners such as USA Football, are committed to educating the youth on the safety of football, as we know that young football players look to the professionals for guidance.

The NFLPA will look to other studies but will also commission studies to augment and further existing research. This is a new era of commitment, education and accountability and we will not miss an opportunity to keep our players safe.

Benefits and Other Aid

The 88 Plan (the "Plan"), effective February 1, 2007, was collectively bargained by the NFLPA and the NFL Management Council, after an aggressive push by the NFLPA. The plan provides benefits to players with dementia, as defined by the Plan. The Plan was named in honor of John Mackey, who wore the number 88 and was diagnosed with dementia. A player is eligible for this benefit if he is vested due to credited seasons or if he has received total and permanent disability and if the player's condition meets the Plan's definition of dementia. Sylvia Mackey, wife of John Mackey, is the quintessential testament as to why this Plan was a necessity. In speaking with her, I realize that all of the negotiating is well worth it when we can assist one of our player pioneers and see that he is cared for by us, especially when there were no other resources.

To apply for the benefits of the Plan, a player or his proxy must submit an application to the Plan Board. The Board has six voting members, three of whom are selected by the NFLPA and three of whom are selected by the NFL Management Council. The current NFLPA-appointed 88 Plan Board members are all former NFL players and NFLPA officers. Once an application is approved, the 88 Plan Benefits Administrator collects, processes and pays claims for the beneficiaries.

There are a variety of costs covered by the Plan, within limits, including institutional and home care, physician services, medical equipment and prescription medication. It is important to note that the maximum payment differs between players that are institutionalized and those that are receiving home care from an unrelated third party; the maximum is $88,000 per Plan year for institutionalized care and $50,000 per year for non-institutionalized care. The benefits are payable for the duration of the dementia but are reduced by the amount of any total and permanent disability benefits paid under certain provisions of the Bell/Rozelle Retirement Plan.

Improvements to the existing 88 Plan, such as increasing the maximum annual payment from $88,000 to $100,000, due to the rising cost of health care and eliminating the difference in the benefit between home care and institutional care, are also being considered. I also will commission a study of whether we should expand the coverage of the 88 Plan to include other neurological degenerative diseases. Additionally, the funding of future studies is imperative to our continuous education on the effects of head injuries. The National Institute of Health or a similar agency is positioned as an objective candidate to conduct such a study.

We cannot emphasize enough that we have to get this issue right. It is not simply to ensure the safety of our NFL players; it is so our efforts will set the standard for the sport as a whole and potentially prevent injuries in youth, high school and college football as well.

I thank you for this opportunity to testify before the Committee and I look forward to answering your questions.

5

Mr. CONYERS. Thank you, Attorney Smith.

Our next witness is the daughter of the late Hugh Culverhouse, the first owner of the Tampa Bay Buccaneers, Dr. Gay Culverhouse. She has an MA and a doctorate in education from Teachers College, Columbia University.

While her father was owner of the Buccaneers, she served in administrative roles within the team and eventually became its president. She is in the process of concluding her work on a book entitled, *Violence: The Underbelly of the National Football League,* which was prompted by learning about the deteriorating health of her former players who suffered from concussions.

She has received many other degrees and honors, and I am very happy to have her before us here today.

Welcome.

TESTIMONY OF GAY CULVERHOUSE, Ed.D., FORMER PRESIDENT, TAMPA BAY BUCCANEERS

Ms. CULVERHOUSE. Thank you us, Mr. Chairman, and thank you, Committee, for giving me the opportunity to address you today. It is a great honor for us.

Mr. CONYERS. Pull it closer.

Ms. CULVERHOUSE. I will just yell.

In 1974, my father was awarded the expansion team in Tampa, Florida. And, from that point on, I have been intimately involved in football. Prior to that, I did go to the University of Florida. The years I was there, Steve Spurrier was the Heisman Trophy Award winner.

Yes, I am a grandmother of six children, and I feel like these people's grandmother here because I have been involved in football for so long.

The one thing that I would like to bring to your attention that I think that I can have a unique perspective on is—Mr. Goodell spoke to the medical aspects and having the doctors make these decisions.

One of the things you, as a Committee, need to understand very clearly is the fact that the team doctor is hired by the coach and paid by the front office. This team doctor is not a medical advocate for the players. This team doctor's role is to get that player back on the field, even if that means injecting the player on the field.

I have seen a wall of players surround a player, a particular player, and seen his knees injected, seen his hip injected between plays and him back on the field. This is inexcusable. And I want you to understand the role that the medical community has in facilitating these concussions.

The players get to a point where they refuse to tell the team doctor that they have suffered a concussion, as well. They do not self-report because they know there is a backup player sitting on the bench ready to take their position. Most of their contracts are back-end loaded with performance bonuses. They need those extra yards and those interceptions in order to make their salaries.

The team doctor goes to the combine, where he goes over the medical records and helps the team coach choose the incoming players for the next season. He is involved in the draft process because he evaluates how severe that knee injury was in college, or that concussion. He is part of the selection process. So he has a very vested interest in that player's success on the field.

The team doctor dresses as a coach on the sidelines, and he acts in many ways as a coach on the sidelines. He is not an independent advocate for the player. If a player chooses independent medical

counsel, he is considered to be not a team player. He becomes a pariah to the team. We have to stop that.

We also need to have at every game an independent neurologist or neurosurgeon on the sidelines who takes care of either side in the game, who is not prejudiced, who is independent, who can make an independent judgment if he sees a player in a huddle throwing up.

Something needs to be done about this medical care. You cannot leave it in the hands of the team physician to make these decisions. And the players are at the point now where they will not self-report because they need the money. They are a disposable commodity. There is a draft coming up every April, and these players fight to hold on to their jobs. And they welcome shots and anything else that will keep them on the field. This is, in my idea, inhumane.

And I have watched it since the early 1970's, and I will tell you that it has not changed. Do not be fooled that, since I left the game in 1994, that this game has changed. You can see the discussions on whether Tim Tebow of the University of Florida should play against LSU. My grandson is 9 years old. Tim Tebow is his idol. You better believe my grandson is going rush back out there and play. We need an independent doctor on the sidelines to tell my grandson "no."

I appreciate the opportunity to address you. Thank you.

[The prepared statement of Ms. Culverhouse follows:]

PREPARED STATEMENT OF GAY CULVERHOUSE

Gay Culverhouse, Ed.D.
403 Barbara Lane
Tampa, Florida 33609

The following remarks have been prepared for the House Judiciary Committee hearing "Legal Issues Relating to Football Head Injuries" to be held Wednesday, October 28, 2009.

My father Hugh Culverhouse was awarded a National Football League expansion team in 1974. From that point until his death in 1994, I was intimately involved in football. I served for ten years in an administrative role first as vice president for community relations and treasurer and then as the president. I was at that time the highest-ranking woman in the NFL.

From the beginning let there be no mistake, football consists of a series of games being played to determine the ultimate Super Bowl champion. Contrary to popular opinion, this is no longer a rich man's hobby. In reality this is a cutthroat business. The goal is for the franchise to make money. The product is games on the field. The "win" is a positive financial bottom line.

From this vantage point, the most important insight I can give this committee concerns the medical care of the players. This care is entrusted to the team physician: a man who is hired by the coach and paid by the front office. This doctor has the ability to choose his assistants without interference from the administration.

This doctor reports to the coach. He attends the combine prior to draft day and gives his input as to the status of players' previous college injuries. He is part of the physical examines and pours over the medical records of the NFL hopefuls. Clearly he is helping the coaches choose the incoming team.

The team doctor is invested in the performance of these players who make the team. He does not want to be seen as lacking in assisting the coach in his selection. The team doctor wants these players to succeed in helping the team win games. The team doctor gets to the point where he will do anything to enhance the performance of these rookies. With very few draft choices, the decisions on whom to draft are critical to a team's success. Hence, from the beginning, the team doctor is invested with the coach in the success of their choices.

This alignment is the crux of the problem for the players on the team. The doctor is not their medical advocate. He's not even conflicted. He knows who pays his salary; he plays golf with the coach and the owner not the players. He is management; he makes decisions for the management side of operations. He understands the bottom line is business. The team that wins, sells more luxury seats, skyboxes and fills the stadium. Therefore, more parking is sold on game day along with more beer, sodas, and cotton candy. That is the term of success.

If a player suffers an injury, the team doctor's role is to find a way to have that man on the field the following game, if not the same game. The player is shot with cortisone during the game to see if the pain can be numbed if it is a joint or other such problem. If it is a head injury, he is told to "shake it off". The players get to the point that they know better than to complain that they have suffered a concussion. They would rather throw up in the huddle away from the fans' lines of vision and keep themselves in the game. Other players will guide them through the next few plays until their double vision resolves itself.

The reasons for this behavior are easily understood. Most contracts are back-end loaded with bonuses. There is a set of criteria that must be met to attain the bonus money. You cannot reach those goals by sitting on the bench. Likewise, the player is very aware that there is a back-up player on the bench waiting his chance to replace the starter and hold onto the position. Therefore, an injured player cannot afford to leave the field of play.

The assistant doctors that the team doctor hires for the games understand their roles as well. If they disagree with the primary doctor, they are dismissed. This is literally bad for their medical practice. How many times have you heard an acquaintance say, "The doctor for the Miami Dolphins did my knee replacement", or " Yeah, I got an appointment with the Patriot's doctor to look at my elbow"? There is status conferred on the doctors. Their business benefits from their association with an NFL franchise team.

At no time, however, do these medical personnel work for the benefit of the players. If they are foolish enough to care about the players they treat, they are fired. No coach wants to hear that his star quarterback cannot play on Sunday. The coach only wants that man on the field in his position; he rarely asks how that is going to be accomplished. At that point, the doctor becomes creative.

We have been reared in America to trust doctors. We loved Dr. Welby. We knew the doctor was on our side even when he told us things we did not wish to hear. He had our wellbeing as his primary mission. Young men in college and entering the NFL believe that the doctor is there for them as well. Why would the rules have changed? It takes the players a while to get the message that they are being asked to play in some situations that are not comfortable. After all, they are viewed as a business commodity not an employee. Then they are being shot to mask pain. At this point they realize the doctor is working for the management.

When a player goes outside the system for a consultation, he is immediately suspect. He is not a "team player"; he has shown that he does not trust the medical staff. He becomes a pariah because he has broken with the team system. Other players who may refuse to practice or play are called lazy or injury prone. If a player sets out to protect himself, he is probably on his way to another team or retirement.

The team doctor is hired in a variety of fashions. Our doctor happened to be a fine golfer. Our coach was enamored by golf although he was not particularly good. They met on a golf course, hit it off and we had ourselves a general surgeon as a team physician. We

were not unique as to how certain physicians became employed with teams. However, most teams had orthopaedists as their primary doctors.

Although I left the National Football League as an executive upon the death of my father, I continue to have season tickets for the University of Florida and until recently the Jacksonville Jaguars. I follow the sport with a mix of enthusiasm and curiosity. I, like most fans, want my teams to win. However, I look with a jaundiced eye when a player returns to the field after an injury or a particularly hard hit. I know that at half time, a good proportion of the players are getting intra venous therapy to replace the fluids they lost in the first half of the game. I know that arm cuffs will likely be used to speed the IV process. I know that this is against medical best practices. I know the chaos in the locker room as players are mended and injected to get back on the field.

I am supportive of the research on concussions and injuries and am concluding a book I have written: Violence: The Underbelly of the NFL. This book was prompted by my experiences with my former players. I am shocked at their deteriorating health and their inability to receive disability compensation from the National Football League Players Association. When these men played, there were no huge salaries. Their sons and daughters just out of college are making more money than these players did. They are no longer besieged for autographs. They walk through our lives looking like old men crippled by arthritis and, in some cases, dementia. My men have headaches that never stop. They cannot remember where they are going or what they want to say without writing it down. Some are on government welfare. Some are addicted to pain medications. Some are dead.

Much to my dismay, last year my eight-year old grandson joined a youth football team. In his first year, he made the All Star team and played in the Toy Bowl. At age nine, the coach is thrilled to have him return to the team. He is built like an offensive lineman but at this age plays both ways because he is bright and can remember the plays. His idol is Tim Tebow, the quarterback at the University of Florida who recently suffered a very public concussion. And since Tim went back in the game at his first opportunity, he set

the stage for my grandson to do the same. This game has to change. "Game" is a misnomer. This business has to change. My grandson means too much to me to sit on the sidelines and not mandate change. I have seen his future in the bodies and eyes of my former players. I know what is happening in the locker room. Please change football before my grandson is damaged.

Foremost is the fact that players need to be protected; the medical system harbored by the NFL must change. There should be doctors without vested interests and allegiances available to the players at no penalty. There should be medical advocates for the players. There should be an independent neurologist on every sideline. There should be salaries free of performance bonuses so that players are not pushed beyond what is reasonable. There should be mandatory guidelines for concussions specifying the number of weeks a player MUST sit out games. There needs to be a call for common sense to prevail in the National Football League.

Recently one of my former players referred to me as a "rebel with a cause". By breaking ranks with the National Football League, I have become that rebel. My cause is the health and wellbeing of all football players whether they are eight year olds or twenty-two year olds. Safety must come first. Business must come second.

Thank you for inviting me to address this august committee. I sincerely appreciate the opportunity to express my knowledge and feelings on this subject.

Mr. CONYERS. Thank you very much, Dr. Culverhouse.

Dr. Andrew Tucker, medical director of the Union Memorial Sports Medicine Program in Baltimore; fifteen years' experience providing primary medical care to professional, collegiate, scholastic, and recreational athletes; head team physician for the Baltimore Ravens, and serves on a number of advisory committees focused on performance-enhancing agents, mild traumatic brain injury, and cardiovascular health. And, as I understand it, is currently the president of the National Football League Physicians Society.

He has written chapters on various subjects, sport health topics, including concussions. And I will put the rest of his resume, which is pretty long, into the record, as I will with all of the other panelists.

[The information referred to follows:]

ANDREW MORRIS TUCKER, MD

Curriculum Vitae

OFFICE ADDRESS: Union Memorial Sports Medicine
1407 York Road, Suite 100A
Lutherville, MD 21093

PERSONAL INFORMATION:

Birthplace	Terre Haute, Indiana
Hometown	Paris, Illinois
Birthdate	November 9, 1960
Citizenship	U.S.
Marital Status	Married (Sheldon)
Children	Andrew, Jr. (7/7/93)
	Sarah (7/7/93)
	Caroline (2/20/97)

EMPLOYMENT:

7/26/04 – Present	Medical Director Union Memorial Sports Medicine Union Memorial Hospital Baltimore, MD
7/8/96 - 7/26/04	Director of Primary Care Sports Medicine University of Maryland Medical Center Assistant Professor, Department of Family Medicine University of Maryland School of Medicine
1/21/91 – 7/8/96	Cleveland Clinic Foundation Section of Sports Medicine Cleveland, Ohio
	Assistant Clinical Professor Department of Family Medicine Case Western Reserve University

EDUCATION:

Fellowship:	Primary Care Sports Medicine Alabama Sports Medicine and Orthopaedic Center Birmingham, Alabama January, 1990 – December, 1990 Directors: Dr James Whiteside, Dr James Andrews
	Sports Medicine Bowman Gray School of Medicine/Carolina Baptist Hospital Winston-Salem, North Carolina July, 1989 – December, 1989

Postdoctoral:	Family Practice North Carolina Baptist Hospital Bowman Gray School of Medicine Winston-Salem, North Carolina
Internship:	July, 1986 – June, 1987
Residency:	July, 1987 – June, 1989 Co-Chief Resident – July, 1988 – June, 1989
Medical School:	Southern Illinois University Springfield, Illinois Degree – M.D. – May, 1986
Undergraduate:	Wake Forest University Winston-Salem, North Carolina Degree – Biology (BA) – May, 1982, Cum Laude

MEDICAL LICENSURE:

Maryland:	#D0050841

CERTIFICATION: American Academy of Family Practice 1989-1996, 1996-2003, 2003-2010
AAFP Certificate of Added Qualification (Sports Medicine), 1993-2003, 2003-2013

PROFESSIONAL ACTIVITIES:

Head Team Physician, Baltimore Ravens, 2001-present
Team Physician, Baltimore Ravens, 1996-2001
Associate Team Physician, Cleveland Browns, 1991 – 1996
President -NFL Team Physician Society 2007-2009
Chairman, NFL Advisory Committee on Cardiovascular Health, 2004- present
Member, NFL Committee on Mild Traumatic Brain Injury, 1994 – Present
NFL Advisory Committee on Performance Enhancing Agents, 1992 – Present
Team Physician, University of Maryland, Baltimore County, 1996 – Present
Team Physician, Coppin State College, 1996 – Present
Consulting Team Physician-Morgan State University, 2004-Present
Consulting Team Physician-Loyola High School, 2003-Present
Consulting Team Physician Loyola College, 2004-Present
Program Co chair, Union Memorial Sports Medicine Symposium, 11/06, 10/07
Program co-chair, Sports Medicine and Football, 2006 perspective, AOSSM/NFL, 5/06, Hollywood, FL
Consulting Team Physician, University of Maryland, College Park, 1997 – 7/26/04
Member, NFL Team Physician Executive Committee, 1999 – Present
President, American Sports Medicine Institute Fellowship Society, 1999 – 2001
Team Physician, Cleveland State University, 1991 – 1996
Team Physician, Shaker Heights High School, 1991-1996
Medical Consultant, Cleveland Ballet, 1991-1996
Program Committee Member, AMSSM Annual Meeting, 1996
US Senior Open Golf Championship Medical Committee, 1995-1996
Medical Team for Revco Criterium Bike Race and Revco Marathon, 1991-1996
NIKE/Cleveland Open Golf Tournament medical coverage, 1993-1995
AOSSM/AMSSM Committee – HIV and Sports- Position Statement, 1993-1994

Reviewer: American Family Physician
Physician and Sports Medicine
Archives of Family Medicine
British Journal of Sports Medicine

PROFESSIONAL SOCIETIES:

Diplomate, American Academy of Family Physicians
American College of Sports Medicine
American Sports Medicine Institute Fellowship Society
American Medical Society for Sports Medicine
Cleveland Clinic Foundation Warthog Society
National Football League Team Physician's Society

PUBLICATIONS:

Tucker AM, Vogel RA, Lincoln AE, et al. "Prevalence of cardiovascular disease risk factors among National Football League Players", JAMA. 2009 May 27; 301(20): 2111-9.

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Tucker AM. "Abdominal muscle strains," "hip pointer," "lateral collateral ligament tear" in The 5 Minute Sports Medicine Consult, Bracker MD ed. Lippincott Williams and Wilkins, 2001

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Tucker AM. "Therapeutic and Ergogenic Drugs in Sports," in Injuries In Baseball, Andrews JR, Zarins B, Wilk K., eds., Lippincott-Raven,1998, pp.425-430.

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Tucker AM. "Examination of School Athletes and Their Preparation for Competition," Clinical Preventive Medicine, Matzen, RN and Lang, RS eds. Mosby, 1993, pp. 339-353.

Escher SE, Tucker AM. "Cold urticaria in a 25-year-old runner," Physician and Sports Medicine. Vol 20, No 12, December 1992, pp. 72-84.

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PRESENTATIONS/LECTURES/ABSTRACTS AT NATIONAL MEETINGS:

"Update on the NFL concussion management program," The National Sports Concussion Summit, Marina Del Rey, CA, 4/18/08

"Management of concussion in the NFL," 2nd Annual Rodeo Medicine Conference, Oklahoma City, OK, 1/18/08

"Concussions and same day return to play," NFL Player Health and Safety Meeting, Chicago, 6/19/07

"Echocardiography characteristics in a sample of professional football players" AM Tucker, RA Vogel, AP Yates, EJ Pellman, RA Heyer, PWF Wilson, American College of Sports Medicine, New Orleans, 5/31/07

"Recurrent concussion-football" BJ Krabak, A Cosgerea, A Tucker, E McFarland, American College of Sports Medicine, New Orleans, presented by Dr Tucker, 5/30/07

"Heat injury in athletes", "basic nutrition for athletes", "NSAID and acetaminophen use in athletes", "sports dermatology", "foot and ankle exam", ACSM Team Physician Course, La Jolla, CA, 2/28-3/4/07

"Ethics and the professional team physician," Sports Medicine and Football: the 2006 perspective, AOSSM/NFL Team Physician's Society, Hollywood, FL, 5/11/2006

"Heat injuries in professional football players", "Players assistance program", NFL Owner's Meeting, Maui, HI, March 18-20, 2005

"Heat injury in athletes", "sports nutrition", "NSAID and acetaminophen use in athletes", "sports dermatology", "knee exam", ACSM Team Physician Course, San Antonio, TX, 2/05

"Lessons learned from the NFL Committee on Mild Traumatic Brain Injury", Cleveland Clinic Warthog Orthopedic Society Meeting, Birmingham, AL, 5/13/04

"Concussions" NFL Coaches Symposium, Orlando, FL, 5/11/04

"Dietary supplements in baseball," Baseball Medicine: Injury Prevention and Treatment Techniques, Baltimore, MD, 1/9/04

"Treatment with oral corticosteroids- a survey of NFL Team Physicians," NFL Team Physicians Scientific Meeting, Indianapolis, IN, 2/20/03

"Update from the National Football League," New Developments in Sorts-Related Concussion, Pittsburgh, PA, 7/20/02

PRESENTATIONS/LECTURES/ABSTRACTS AT NATIONAL MEETINGS (continued)

"Update from the NFL Committee on Mild Traumatic Brain Injury," New Developments in Sports Related Concussion, Pittsburgh, PA, July, 2001.

"Hypertension in Athletes," Update in Sports Medicine, Phoenix, AR, May, 2001.

"The Use of Complimentary Medicine Treatments in Professional Football Players," NFL Team Physicians Sports Science Exchange, Indianapolis, IN, February, 2000

"Update on the NFL Committee on Mild Traumatic Brain Injury," Concussion in Sports, Orlando, FL, 6/99

"Muscle Cramps and Dehydration in Athletes," American Sports Medicine Institute Fellowship Meeting, Birmingham, AL, 6/4/99

"Hypertension in Athletes," NFL Team Physician Course, Bal Harbour, FL, 5/8/99

"Hip Dislocation in a Professional Football Player," Curtin, S. and Tucker, AM; poster presentation at AMSSM Annual Meeting, Hilton Head Is, SC, 4/7/99

"Essential Medical Information for the Orthopaedic Team Physician," and "Head Injuries in Athletes," Southern Orthopaedic Association Winter Meeting, Aspen, CO, 3/20/99

"Update on NFL Committee on Mild Traumatic Brain Injury," Concussion in Sports, Orlando, FL, 2/98

"The Natural History of MTBI in High School Football Players," abstract presentation, American Sports Medicine Institute Fellowship Society Meeting, Birmingham, AL, 6/97

"Hypertension in the Athlete," NFL Team Physician Course, San Francisco, 4/97

"Essential Medical Information for the Orthopaedist as a Team Physician," Instructional Course lecture, AOSSM, Orlando, FL, with JA Bergfeld, AJ Cianflocco, and RJ Dimeff, 6/16/96-6/17/96

"Vocal Cord Dysfunction in a High School Basketball Player, American College of Sports Medicine Annual Meeting, Cincinnati, OH, 5/30/96

"Essential Medical Information for the Orthopaedist as a Team Physcian, Instructional Course lecture, AAOS, Atlanta, GA, with JA Bergfeld, AJ Cianflocco, and RJ Dimeff, 2/19/96

"Essential Medical Information for the Orthopaedist as a Team Physician," Instructional Course lecture, AOSSM, Toronto, with JA Bergfeld, AJ Cianflocco, and RJ Dimeff, 7/17/95

"Knee Instability in a Soccer Player," Snell E, Tucker AM, Parker R, American College of Sports Medicine Annual Meeting, Minneapolis, MN, 6/2/95

"Atypical Stress Fracture," American College of Sports Medicine Annual Meeting, Indianapolis, IN, 6/2/94

"Football Injuries-Elbow and Shoulder" and "Sports-Related Abdominal and Genital-Urinary tract Injuries," Medical College of Wisconsin Annual Sports Medicine Meeting, Milwaukee, 4/15/94

"Hypertension and Diabetes," NFL Team Physician Meeting, Washington, DC, 3/25/94

"Most Frequent Soccer Injuries," and "Evaluation and Initial Treatment of the Injured Athlete," First International Course, Prevention and Treatment of Soccer Injuries, Mexico City, 3/9/94-3/11/94

Presentations/Abstracts/Lectures at National Meetings, continued

"Knowledge and Attitudes of Professional Football Players Regarding HIV and Sports," abstract presentation, NFL team Physcians Sports Science Symposium, Indianapolis, 2/1/94

"Hematuria in a Football Player," American College of Sports Medicine Annual Meeting, Seattle, 6/3/93

"Thoracic outlet-football," American College of Sports Medicine Annual Meeting, Dallas, 5/29/92

"Prescription and Over-the-Counter Medications in Sports," Injuries in Baseball Course, Birmingham, AL, 1/11/92

Miscellaneous Activity at National Meetings

Panel Discussant, Head Injury Case Presentations, American College of Sports Medicine Annual Meeting, 5/29/08, Indianapolis, IN

Research

Principal investigator, "Cardiovascular health risk factors of professional football player" IRB through MedStar , submitted to JAMA 11/08, revisions submitted 4/09

Principal investigator, "Cardiovascular risk factors in retired professional football players", submitted to MedStar IRB 4/08

Mr. CONYERS. Dr. Tucker, we are very pleased that you could be with us today.

TESTIMONY OF ANDREW M. TUCKER, M.D., MEMBER, NFL MILD TRAUMATIC BRAIN INJURY COMMITTEE AND TEAM PHYSICIAN, BALTIMORE RAVENS

Dr. TUCKER. Thank you, Mr. Chairman.

I will correct one piece of information. I am past president of the NFL Physicians Society, immediate past president.

I have been a team physician in the NFL since 1991 and a member of the NFL Committee on Mild Traumatic Brain Injury since its inception in 1994. From both perspectives, I have seen positive changes both in the science and in the culture related to the injury of concussion in the NFL and would like to summarize these for you now.

First, from the perspective of the concussion committee member. In 1994, when Commissioner Paul Tagliabue requested that a committee be formed to determine what was known about concussions in sports and to study every facet of the injury as it related to the game of football, it revealed a stark reality: We did not have much scientific data on sports-related concussions.

Evaluation and treatment guidelines were well-intentioned but not based on solid science. Major helmet manufacturers told us that their products had not changed substantially in many years. Their products were adequately protecting players from catastrophic brain injuries, but there was no stimulus for innovation to decrease the risk of concussion.

The first several years of the committee activity concentrated on understanding the very basic epidemiology, the who, what, why, where, when of the injury. And that study continues even today.

In parallel work, the committee enlisted the help of highly respected biomechanical people from academic communities in the United States and Canada to study concussions in professional football in new and creative ways.

Game videotape of actual concussive injury on the field of play was studied and analyzed. Researchers were able to recreate laboratory reconstructions of collisions of helmeted test dummies that accurately represented what was happening to players on the field. In effect, this had never been done before.

Research breakthroughs resulted in many tangible benefits, which are listed in your statement, and I will just highlight a few.

Number one, helmet design. The information that we shared with helmet manufacturers was a critical stimulus to the first substantive changes in helmet design in many years and provides us with some optimism that the risk for concussion in players at all levels—not elimination, but the risk of concussion in players of all ages might decrease with these improved designs.

Secondly, helmet testing. Because we have a valid laboratory protocol for recreating the conditions that result in concussion on the field, this laboratory set-up can be used to evaluate the new products that I just spoke about.

Thirdly, the interaction with NOCSAE, also part of helmet testing. NOCSAE, as you may know, is the committee that establishes safety standards for sports equipment, including helmets, the same helmets that our players wear, the same helmets that our children wear. The biomechanical research allowed us to understand that the speeds and forces associated with injury and concussion in the

NFL were quite a lot different from what they were using to test helmets. Thus, our open dialogue with NOCSAE has resulted in modifications in how helmets are tested for efficacy.

And as the commissioner reminded us, number four: rules changes. A greater understanding of how concussions occur on the field has been shared with the National Football League and provides the Competition Committee with valuable, objective information to make rule changes to protect players and make the game safer.

I would like to also take a couple of moments to talk about neuropsychological testing and, also, the study of retired players.

Neuropsychological testing has been utilized in the study of neurological patients for over half a century. Our colleagues in Pittsburgh and other academic centers were leaders in developing neuropsych testing for the evaluation of brain injury in athletes in the early 1990's. The test has evolved into a valid and reliable evaluation and management tool for sports-related concussion.

Our committee was instrumental in supporting the use of this technology across all NFL teams in the mid to late 1990's. Today, its use is mandated for all NFL clubs. The committee's support of this tool was also instrumental in promoting the use of the evaluation and treatment of athletes at all levels of competition.

Retired players: The study of retired players remains probably the most concentrated focus of our committee's activities today. While other researchers have published findings from survey and questionnaire data that suggest that recurrent concussions may increase the risk for chronic changes in brain function in retired players, our committee has noted this, we regard it as valuable, we regard it as concerning, and we regard it as not yet definitive. These are due to limitations in research methods, which will be spoken about.

The committee is supervising a study of retired players that involves comprehensive neurological testing and imaging with a control group of men who have played college football in order to more definitely ascertain whether playing professional football is associated with increased risk of brain dysfunction in the retired athlete.

The issue of chronic traumatic encephalopathy in former players has been and will be a most vigorously examined, debated, and scrutinized topic among experts inside and outside our committee. Some experts believe autopsy findings of former football players are due solely to the effects of trauma, while other experts feel repetitive head trauma and repetitive concussions are only a piece of the puzzle of a very complicated issue. The committee has hosted scientific exchanges on this topic as recently as May and will have another meeting next month.

Lastly, education: Education of our own medical staffs, players, coaches, and team administrators has been a priority of our committee since its inception. The first educational symposium was soon after the committee started in the mid 1990's. The most recent one was in Chicago in 2007, and another is being planned for 2010.

Ongoing concussion education is regularly a part of our scientific interchanges at the combine in Indianapolis on an annual basis. And we have shared our knowledge and experiences with our col-

leagues in sports medicine through our biannual NFL team physician meetings.

Clearly, the last 15 years has been a time for important advances in concussion research and clinical care. While our committee has published 17 articles from our research, we hardly admit that we have all the answers. Our charge remains overseeing quality research for the benefit of our active and retired players and to advance the science of sports-related concussion.

My last perspective is that of a team physician. There are many challenges to evaluating and treating concussions in athletes of all ages. While the injury is easy to diagnose in some cases, there are other situations in which—many situations, actually, in which an athlete who has sustained a concussion is difficult to diagnose.

With concussion, as with any other medical issue, the medical staff is dependent on the athlete giving us accurate information to help us make a diagnosis and properly care for the player.

Team physicians and athletic trainers have long observed two primary barriers to this important exchange: First, the athlete for too long has thought that being dinged or mildly concussed is simply part of the game and not important information to share with their medical staff. Secondly, athletes want to compete and they want to play, and they tend not to give us information that might result in restriction to play.

I feel strongly that, not only in NFL players but, as well, my high school and college athletes, these barriers of, number one, lack of patient education and, number two, a conscious reluctance to share information are much less imposing now than they were 10 or 15 years ago.

Finally, as a team physician at all levels of competition, I certainly evaluate and manage concussions differently today than I did 15 years ago. While we try to understand the potential effects of head injury on our currently retired players, I don't think it is wise to indict the care being provided today's players based on reports treated a generation or more ago. I am truly optimistic the care being rendered to today's athletes will prove very beneficial to the retired athletes of tomorrow.

Thank you, Mr. Chairman.

[The prepared statement of Dr. Tucker follows:]

PREPARED STATEMENT OF ANDREW M. TUCKER

Andrew M Tucker, MD
Medical Director, Sports Medicine, Union Memorial Hospital, Baltimore, MD
Member, NFL Committee on Mild Traumatic Brain Injury
Head Team Physician, Baltimore Ravens

Hearing: Legal Issues Relating to Football Head Injuries
October 28, 2009

I have been a team physician in the NFL since 1991 and a member of the NFL Committee on Mild Traumatic Brain Injury since its inception in 1994. From both perspectives, I have seen positive changes, both in the science and in the culture, related to the injury of concussion in the NFL and would like to summarize these observations over the next few minutes.

I. The perspective of MTBI Committee member.

In 1994, Commissioner Paul Tagliabue requested that a committee be formed to determine what was known about concussions in sports, and study every facet of the injury as it related to the game of football. The first request revealed a stark reality—we did not have much scientific data on sports related concussions. Evaluation and treatment guidelines were well intentioned but not based on solid science. Major helmet manufacturers informed us their products had not changed substantially in many years. Their products were adequately protecting players from catastrophic brain injuries, but there was no stimulus for innovation to decrease the risk of concussion.

The first several years of Committee activity concentrated on understanding the very basic epidemiology (the who, what, why, where, when of the injury) as seen in professional football. Beginning in 1996, team medical staffs documented every diagnosed injury by completing initial and follow up forms. The record keeping continues today on all 32 teams.

In parallel work, the Committee enlisted the help of highly respected biomechanical experts from the academic communities in the US and Canada to ambitiously study concussions in professional football in new and creative ways. Game videotape of actual concussive injury on the field of play was studied and analyzed. Over time, the researchers were able to create laboratory reconstructions of collisions of helmeted test dummies that accurately represented what was happening to players on the field of play. This had never been accomplished before with sports concussions and the research breakthroughs resulted in tangible benefits:

- **Helmet design**- The video analysis of dozens of collisions resulting in concussion allowed us to understand concussion in new ways. The location of impact in the concussed player was found to be often on the side of the helmet, or the facemask. This information shared with the helmet manufacturers was a critical stimulus to the first substantive change in helmet design in many years, and provides us some optimism that risk of concussion for players at all levels may be decreased with these improved designs

- **Helmet testing-** as the biomechanical experts have developed a valid laboratory protocol for recreating the conditions that result in concussion on the field, this same laboratory set up can be used to evaluate the possible effectiveness of new helmets in decreasing concussion risk.
- **Helmet testing part II-the interaction with NOCSAE** (the committee that establishes safety standards for sports equipment, including helmets) - The biomechanical research allowed us to understand the speeds and forces involved with injury. We learned that the speed of colliding players resulting in concussion was often far greater than the speed used to test helmets by the safety committee charged with evaluating helmets. Open dialogue with NOCSAE is resulting in modifications in how helmets our tested for efficacy
- **Rules changes**- greater understanding of how concussions occur on the field was shared with the NFL and provides the Competition Committee with objective information on which to make rules changes to protect players and make the game safer

Neuropsychological testing, the study of retired players, and ongoing education.

Neuropsychological testing has been utilized in the study of stroke patients, dementia, and severely brain injured patients for over 50 years. Our colleagues in Pittsburgh, and in other academic centers, were leaders in developing neuropsychological testing for the evaluation of mild brain injury in athletes since the early 1990's. The test has evolved as a valid and reliable evaluation and management tool for sports related concussion for professional, collegiate, high school, and recreational athletes. Our Committee was instrumental in supporting the use of this technology across all NFL teams in the mid to late 1990's. Today, its use is mandated for all NFL clubs. The Committee's support of this tool was instrumental in promoting its use in the evaluation and treatment of athletes in all levels of competition.

The study of retired NFL players remains the most concentrated focus of our Committee. Other researchers have published findings from survey and questionnaire data that suggest that recurrent concussions may increase the risk for chronic changes in brain function in retired players. The Committee regards these data as valuable, concerning, and yet not definitive, due to the limitations of these research methods. The Committee is supervising a study of retired players that involves comprehensive neurological testing and imaging with a control group of men who played college football (but not professional football) in order to more definitely ascertain whether playing professional football is associated with increased risk of brain dysfunction in the retired athlete.

The issue of a chronic traumatic encephalopathy in former football players has been, and will be, a most vigorously examined, debated and scrutinized topic among experts inside and outside our Committee. Some experts believe the autopsy findings of former football players are due solely to the effects of trauma. Other experts feel repetitive head trauma, or repeated concussions, is only a part of the puzzle of this complex issue. The Committee has hosted scientific exchanges on this topic as recently as May of 2009, and will have another meeting next month.

Education of our own medical staffs, players, coaches, and team administrators has been a priority of the Committee since its inception. The first concussion educational symposium for NFL team medical staffs was held in New York and Phoenix in 1995. The most recent took place in Chicago in 2007, and another is being planned for 2010. Ongoing concussion education has occurred regularly at our NFL Team Physician Scientific Symposiums at the annual Scouting and Testing Combine in Indianapolis. Sharing our knowledge and experiences with concussion has been point of emphasis at our biannual NFL Team Physician Meetings, an educational course for sports medicine providers conducted with the American Orthopedic Society for Sports Medicine.

Clearly, the last 15 years has been a time for important advances in concussion research and clinical care. While our committee has published 17 articles from our research, we admit we do not have all the answers. Our charge remains overseeing quality research for the benefit of our active and retired players, and to advance the science of sports related concussion. We are actively engaged with other researchers and sports medicine providers in other sports, and other countries, sharing what we have learned and willing to learn from others.

II. The Team Physician Perspective

There are many challenges to evaluating and treating concussions in athletes of all ages. While the injury is easy to diagnose in some circumstances, often times it is not clear an athlete has sustained a concussion. With concussion, as in any other medical issue, the medical staff is dependent on the athlete giving us accurate information to help us make a diagnosis and properly care for their injury, including determining a safe return to play.

Team physicians and athletic trainers have long observed two primary barriers to this important exchange. First, the athlete for too long has thought that being "dinged" is part of the game, and not important to discuss with their medical staff. Secondly, athletes want to compete, and tend not to want to divulge information that might result in restriction to play. I feel strongly that, in NFL players as well as my high school and collegiate athletes, these barriers of lack of patient education and a conscious reluctance to share information, are much less imposing now than they were 10 or 15 years ago. In addition, education programs targeted at our players' families as well as our coaches has resulted in valuable exchanges of information that improves the quality of care for our players.

Finally, as a team physician at all levels of competition, I evaluate and manage concussions differently today than I did 15 years ago. While we try to understand the potential effects of head injury on our current retired players, it would be unwise to indict the care being provided today's players based on reports on players treated a generation or more ago. I am optimistic that care being rendered to today's athletes will prove beneficial to the retired players of tomorrow.

Mr. CONYERS. Dr. Tucker, we thank you for your statement.

I am now pleased to recognize Dr. Robert Cantu, clinical professor of neurosurgery, Boston University School of Medicine; author of over 300 scientific publications, including 21 books on neurosurgery, sports medicine, and lots of chapters on peer-reviewed papers and others of the like.

He has served as associate editor of *Medicine & Science in Sports & Exercise.* He is still doing a lot of health things himself. And we will put this very extensive resume into the record.

[The information referred to follows:]

Dr. Robert Cantu

Currently Dr. Cantu's professional responsibilities include those of Chief of Neurosurgery Service, Chairman Department of Surgery, and Director of Sports Medicine at Emerson Hospital in Concord, Massachusetts, adjunct professor Exercise and Sport Science, University North Carolina, Chapel Hill, Co-Director, Neurological Sports Injury Center, Brigham and Women's Hospital, Boston, Neurosurgical Consultant to the Boston Eagles football team, and Neurosurgical Consultant to the Boston Cannons professional lacrosse team.

He has authored over 300 scientific publications, including 21 books on neurosurgery and sports medicine, in addition to numerous book chapters, peer-reviewed papers, abstracts and free communications, and educational videos. He has served as associate editor of Medicine and Science in Sports and Exercise and Exercise and Sports Science Review, and on the editorial board of The Physician and Sports Medicine, Clinical Journal of Sports Medicine, and Journal of Athletic Training. In 2003 Dr. Cantu became the section head for the Sports Medicine Section of Neurosurgery.

In addition to his professional responsibilities, Dr. Cantu is medical director of the National Center for Catastrophic Sports Injury Research, an ongoing registry instituted in 1982 for data collection and analysis of spine and head injuries. From this data important contributions have been made in sport safety and accident reduction; most notably football rule changes concerning tackling and blocking with the head, the establishment of football helmet standards, improved on-the-field medical care, and coaching techniques. He also serves on the Board of Trustees as Vice President of NOCSAE (National Operating Committee on Standards for Athletic Equipment).

Dr. Cantu published the first ever return-to-play guidelines for sports concussions in 1986. Slightly revised in 2001 and still the most widely recognized guidelines by athletic trainers, he devised the first grading system for concussions based on symptoms at the time of injury (Grades 1, 2, 3) and provided medical professionals with concussion management guidelines where there existed none before.

Dr. Cantu has participated in nationally televised sports programs speaking on diverse sports issues, sometimes as a spokesperson for the ACSM, and often as an independent expert; he has appeared on NFL Today with Bryant Gumbel and Terry Bradshaw discussing the effect of artificial turf on cervical spine injuries, World News Tonight with Peter Jennings regarding NASCAR safety issues and the death of driver Dale Earnhardt, and on ABC World News Tonight with Bob Jamison and ESPN's Outside the Lines to speak about heat stroke and NFL player Korey Stringer's tragic death. In 2007, he was interviewed on HBO's Real Sports with Bryant Gumbel, ESPN's Outside the Lines, and is frequently quoted in the New York Times.

Dr. Cantu is frequently invited to participate in symposia addressing sports medicine topics ranging from anabolic steroid use, eating disorders in female athletes, and the special health and exercise concerns of senior citizens to acute and chronic brain injury in boxing, and on-the-field evaluation, medical management, and return to play guidelines following head and spine sports injuries. In June, 2007, he was one of only four non-NFL experts asked by NFL Commissioner Roger Goodell to participate in the NFL's historic concussion summit in Chicago, where he gave two presentations.

Mr. CONYERS. And I welcome you to the Committee. We are pleased and honored to have you here.

TESTIMONY OF ROBERT C. CANTU, M.D., CHIEF OF NEUROSURGERY SERVICE, AND DIRECTOR, SPORTS MEDICINE, EMERSON HOSPITAL, CONCORD, MA

Dr. CANTU. Thank you, sir.

Mr. Chairman, Members of the Judiciary Committee, I am honored to be here today, and thank you for allowing me to provide this testimony.

I am a neurosurgeon who has spent the past 30 years of my career focusing on issues pertaining to sports-related concussion. As the author of the first return-to-play guidelines after a football concussion nearly 30 years ago, I have been fortunate to be able to participate in the development of and be a coauthor of numerous international—Vienna, Prague, and Zurich—as well as national—the National Athletic Trainers' Association and the American College of Sports Medicine—return-to-play guidelines for athletes following a concussion.

We are here today because there is a growing awareness of the public health crisis we are facing due to long-term consequences of football-related brain trauma. Over the past several years, there has been growing and convincing evidence that repetitive concussive and subconcussive blows to the head in NFL players lead to a progressive neurogenerative brain disease called chronic traumatic encephalopathy, CTE.

This Judiciary Committee hearing was scheduled soon after a newspaper report of an NFL-funded research study of 1,063 former NFL players who were given a lengthy telephone survey, which concluded, among other questions, that the incidence of dementia and memory-related diseases was 19 times higher than the national average in the 30-to-49-year-old age group and nearly six times higher in the over-50-year-old age group.

While this comes as no surprise to those of us at the Center for the Study of Traumatic Encephalopathy at BU, as we have found all brains studied so far of NFL players who played after the age of 25 to have full blown CTE, the question remains, was this survey and their findings accurate? And I am sure we are going to hear more of that shortly.

Unfortunately, the diagnosis of dementia cannot be made on a phone survey, and the term "memory-related diseases" is not a precise medical term. Thus, this study design is highly flawed. But even though it is flawed, it has had a positive effect of increasing the public awareness of this important issue.

I am not here to debate the merits of this study but to point out that we have, in my opinion, a serious public health problem today resulting from repetitive head trauma too often experienced by NFL players. But the problem is much bigger than the NFL. It affects football players at all levels, including college, high school, and youth leagues. And it is not just football. It is all sports at high risk of brain injury, especially hockey, soccer, lacrosse, among others, that is at risk for CTE.

The brain does not know what caused it to be violently shaken inside the skull: a football helmet-to-helmet hit, a left hook to the

jaw, a check against the boards, or even a blast injury in military combat. The response in all may be the conversion of a naturally occurring brain protein, tau, T-A-U, into a hyperphosphorylated form that is toxic to nerve cells and their connections and causes death of nerve cells and disruption of their connections.

While our research shows that this abnormal accumulation of tau is widespread throughout the brains of individuals with CTE, it is especially concentrated in the medial temporal lobe structures, as Dr. Ann McKee will point out for you, and thus leads to a clinical triad of recent memory failure progressive in extreme cases to dementia, depression, and lack of impulse control.

While CTE has been mostly reported in the world's literature in boxers and for the longest period of time, over 80 years, nearly 20 cases in the last several years have been reported from individuals that formally played in the NFL. In our group, we have recently reported a case of CTE in a man who only played football at the college level. So, obviously, some of these individuals have entered the NFL already with incipient, if not full-blown, CTE. Our group has even found the beginning of CTE in an 18-year-old high school athlete who died of rugby-related head trauma.

Now that we are aggressively looking for CTE, there has been a 40 percent increase in the recognized cases in just the last 2 years alone. And we believe this is but the tip of the iceberg.

Thus, I believe we have a serious public health problem and a massive underappreciation of what head trauma, especially multiple head traumas, at both the concussive and subconcussive levels, can lead to. There is no doubt that these injuries do lead to an incurable neurodegenerative brain disease called CTE, which causes serious progressive impairments in cognition, emotion, and behavior control, even full-blown dementia.

Obviously, not every athlete who experiences head trauma develops this disease. Future research will reveal additional important factors that make some athletes more prone than others to developing CTE.

But the public health crisis is already here, and we cannot afford to wait any longer to make changes to the way we play sports, especially sports like football that is today being played in a way far different than it was initially conceived. Blows to the head, as we have heard earlier, need to be minimized through rule and technique changes, especially in those sports such as football.

Thank you.

[The prepared statement of Dr. Cantu follows:]

Testimony Before U.S. House Judiciary Committee
Hearing on Legal Issues Relating to Football Head Injuries
Wednesday, October 28, 2009

Robert C. Cantu, M.D.

Mr. Chairman, members of the Judiciary Committee, I am honored to be here today and thank you for allowing me to provide this testimony. My name is Dr. Robert Cantu. I am a neurosurgeon who has spent the past 30 years of my career focusing on issues pertaining to sports-related concussion. As the author of the first return to play guidelines after a football concussion nearly 30 years ago and over 330 scientific publications, I have been fortunate to be able to participate in the development of and be a co-author on numerous international (Vienna, Prague, Zurich) and national NATA and ACSM return-to-play guidelines for athletes following concussion. I have been honored by being able to take care of tens of thousands of patients who have sustained concussions and other sports-related brain trauma, including many professional athletes. In addition to being Chief of Neurosurgery and Chairman of the Department of Surgery at Emerson Hospital in surburban Boston, I am a Clinical Professor of Neurosurgery at Boston University School of Medicine, where I am also Co-Director of the Center for the Study of Traumatic Encephalopathy.

We are here today because there is a growing awareness of the public health crisis we are facing due to the long-

term consequences of football-related brain trauma. Over the past several years, there has been growing and convincing evidence that repetitive concussive and subconcussive blows to the head in NFL players lead to a progressive neurodegenerative brain disease called chronic traumatic encephalopathy or CTE.

This Judiciary Committee hearing was scheduled soon after a newspaper report of a NFL-funded research study of 1063 former NFL players who were given a lengthy telephone survey which included, among many other questions, items pertaining to whether they were diagnosed as having dementia or other memory related diseases. The survey found the incidence of memory related disease/dementia to be 19 times the national average in the 30-49 year old age group and 6 times higher in the over 50 year old group. This comes as no surprise to those of us at the Center for the Study of Traumatic Encephalopathy at Boston University (CSTE), as we have found <u>all</u> brains studied of former NFL players who played after age 25 to have full blown CTE.

The question remains, however, are these survey findings accurate? Unfortunately the diagnosis of dementia cannot be made on a phone survey and the term "memory related diseases" is not a precise medical term. Thus this study's design is highly flawed. But, even though it is flawed, it has had the positive effect of increasing public awareness of this important issue.

I am here not to debate the merits of this study but to point

out that we have a serious public health problem today resulting from repetitive head trauma too often experienced by NFL players. The problem is much bigger than the NFL, however. If effects football players at all levels, including college, high school, and youth leagues. And it is not just in football, but other sports at high risk of brain injury, including hockey, soccer, lacrosse, among others.

The brain does not know what caused it to be violently shaken inside the skull, a football helmet to helmet hit, a left hook, a check against the boards, or even a blast injury in military combat. The response in all may be the conversion of a naturally occurring brain protein, tau, into a hyperphosphorylated form that is toxic to nerve cells and their connections. While our research shows that this abnormal accumulation of this protein is widespread throughout the brains of individuals with CTE, it is especially concentrated in medial temporal lobe structures and leads to the clinical triad of recent memory failure/dementia, depression, and lack of impulse control.

While most of the cases of CTE in the world's literature have been reported in boxers, nearly twenty cases in the last several years have been reported in former NFL players. Our group has recently reported a case of CTE in a man who had only played in college but who died tragically at the age of 42. Our group has even found the beginning evidence of CTE in an 18 year old high school athlete. Now that we are aggressively looking for CTE there has been a 40% increase in recognized cases in the

last two years, and this is but the tip of the iceberg.

Thus, I believe we have a serious public health problem and a massive under-appreciation of what head trauma, especially multiple traumas, at both the concussive and subconcussive levels, can lead to. There is no doubt that these injuries do lead to an incurable neurodegenerative brain disease called CTE which causes serious progressive impairments in cognition, emotion, and behavioral control, and eventual full-blown dementia. Obviously, not every athlete who experiences head trauma develops this disease. Future research will reveal additional important factors that make some athletes more prone than others to developing CTE. But the public health crisis is already here and we cannot afford to wait any longer to make changes to the way we play sports at high risk of head trauma. Blows to the head need to be minimized through rule and technique changes, especially in those sports such as football that are being played in a far different manner than originally conceived.

Thank you.

Mr. CONYERS. Thank you very much.

We now turn to Dr. David Weir, who is currently a research professor at the University of Michigan's Institute for Social Research, specializing in research on the measurement of health-related quality of life, the use of cost-effectiveness measures in health policy

and medical decision-making, the role of supplemental health insurance in the Medicare population, and has had recent research projects commissioned by the NFL Player Care Foundation.

He was awarded the Cole Prize for best paper in the Journal of Economic History twice, in 1984 and 1995, and the Alfred P. Sloan Research Fellowship.

I presume, Dr. Weir, that you are not connected with the University of Michigan Injury Institute recently formed there.

Mr. WEIR. No.

Mr. CONYERS. All right. We welcome you, and we look forward to your testimony.

TESTIMONY OF DAVID R. WEIR, Ph.D., LEAD AUTHOR, NFL PLAYER CARE FOUNDATION STUDY OF RETIRED NFL PLAYERS

Mr. WEIR. Thank you, Mr. Chairman and Members of the Committee, for inviting me here today.

The Institute for Social Research at the University of Michigan is committed to the use of social science survey research to serve the public interest. And we are always ready to respond to you, as representatives of the public interest.

I appreciate the opportunity to set the record straight on our study of retired NFL players. Faced with the aging of the U.S. population, we are all looking for policies and programs to serve the needs of people after a lifetime of hard work. This unique population of retired football players is an intriguing place to look for challenges and solutions.

Our study had two broad goals: The first, at the request of the NFL, was to describe the population of retired players across a wide range of topics, from marriage and family life to health, to economic circumstances. In an environment of sensationalized press accounts, they sought some basic facts on which to create or improve programs to serve the needs of retired players.

The second goal, at our suggestion, was to lay the foundation for future research that could follow up on specific health problems or other areas of need. I am pleased to say that the NFL agrees with us that further research on the dementia issue is warranted, and we are now actively planning that follow-up effort.

Our initial telephone survey found that retired professional football players are, to put it mildly, a diverse and fascinating group. On average, they are highly accomplished, productive members of their communities, churches, and families. They suffer from aches and pains in shoulders, knees, backs, and necks that make difficult activities that many of us take for granted. Most are in comfortable financial circumstances, though many report having received bad financial advice somewhere along the way. Most have health insurance and are able to get the health care they need. They are proud of their achievements and of their time as professional athletes.

For every such generalization, there are individual exceptions. There are retired players in poverty or without health insurance. Some don't particularly like the NFL. There are some who claim their knees don't hurt.

This diversity is particularly true for the issue of cognitive impairment and dementia that is the focus of the hearing today. In

our telephone interviews, 96 percent of NFL retirees report that they do not have such problems. But 4 percent do, and, in some cases, the disability and the need is profound.

Depending on the severity of the problems, which our study could not assess, those numbers may or may not indicate an elevated risk from a career playing football. We can't draw a conclusion, and no responsible scientist would do so.

Those who assert that the rates reported by former players definitively show a higher risk do so by greatly underestimating the extent of dementia and cognitive impairment in the general population. I wish it were rare, but it is not. It is a major public health challenge facing the country.

The follow-up study will address the major limitations of the telephone study with regard to the measurement of dementia and cognitive impairment. It will utilize the design and methods similar to ones we have used in a much larger study known as the "Health and Retirement Study," which I have the privilege to direct at the University of Michigan with funding from the National Institute on Aging.

The methods and results of this approach to diagnosis of impairment and dementia have been published in peer-reviewed scientific journals. It is done in the home by trained professionals and does not require travel or visits to clinics that might exclude some participants.

With respect to individuals in the NFL study who did report a memory-related illness, it will be important to distinguish between the more severely disabling condition of dementia and the more common but less disabling mild cognitive impairment. The needs of these two groups are very different, and we will assess the extent to which the 88 Plan created by the league and the Players Association is meeting those needs.

With respect to individuals who did not report any memory-related illness, we will seek to determine whether there is any significant dementia or impairment in a sample of cases. By comparison to studies using the same methods in the general population, we would be able to say to what extent retired professional football players differ in their rates of impairment and dementia.

I understand the intense interest in this issue and the impatience to have definitive answers. I have many friends who are parents of teenage athletes, and I know how much it worries them. We will not delay, but getting it right is more important than getting it fast.

To those retired players who we will ask to participate in the next stage of this research, I make the promise that we will protect your privacy and we will report the truth.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Weir follows:]

PREPARED STATEMENT OF DAVID R. WEIR

Testimony of David R. Weir before the House Judiciary Committee

October 28, 2009

Mr. Chairman, members of the committee, thank you for inviting me here today. The Institute for Social Research at the University of Michigan is committed to the use of social science survey research to serve the public interest and we are always ready to respond to you as representatives of the public interest. I appreciate the opportunity to set the record straight on our study of retired NFL players. Faced with the aging of the US population, we are all looking for policies and programs to serve the needs of people after a lifetime of hard work. This unique population of retired football players is an intriguing place to look for challenges and solutions. Our study had two broad goals. The first, at the request of the NFL, was to describe the population of retired players across a wide range of topics from marriage and family life to health to economic circumstances. In an environment of sensationalized press accounts, they sought some basic facts on which to create or improve programs to serve the needs of retired players. The second goal, at our suggestion, was to lay the foundation for future research that could follow up on specific health problems or other areas of need. I'm pleased to say that the NFL agrees with us that further research on the dementia issue is warranted and we are now actively planning that follow-up effort.

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For every such generalization there are individual exceptions. There are retired players in poverty or without health insurance. Some don't particularly like the NFL. There are some who claim their knees don't hurt. This diversity is particularly true for the issue of cognitive impairment and dementia that is the focus of the hearing today. In our telephone interviews, 96% of NFL retirees report that they don't have such problems. But 4% do and in some cases the disability and the need is profound. Depending on the severity of the problems, which our study could not assess, these numbers may or may not indicate an elevated risk from a career playing football. We can't draw a conclusion and no responsible scientist would do so. Those who assert that the rates reported by former players definitively show a higher risk do so by greatly understating the extent of dementia and cognitive impairment in the general population. I wish it were rare, but it is not. It is a major public health challenge facing the country.

The followup study will address the major limitations of the telephone study with regard to the measurement of dementia and cognitive impairment. It will utilize a design and methods similar to ones we have used in a much larger study known as the Health and Retirement Study, which I have the privilege to direct at the University of Michigan with funding from the National Institute on Aging. The methods and results of this approach to diagnosis of impairment and dementia have been published in peer-reviewed scientific journals. It is done in the home by trained professionals and does not require travel or visits to clinics that might exclude some participants. With respect to individuals in the NFL study who did report a memory-related illness it will be important to distinguish between the more severely disabling condition of dementia and the more common but less disabling mild cognitive impairment. The needs of these two groups are very different and we will assess the extent to which the 88 plan created by the League and the Players Association is meeting those needs. With respect to individuals who did not report any memory-related illness we will seek to determine whether there is any significant dementia or impairment in a sample of cases. By comparison to studies using the same methods in the general population we will be able to say to what extent retired professional football players differ in their rates of impairment and dementia.

I understand the intense interest in this issue, and the impatience to have definitive answers. I have many friends who are parents of teenage athletes and I know how much it worries them. We will not delay, but getting it right is more important than getting it fast. To those retired players who we will ask to participate in the next stage of this research I make the promise that we will protect your privacy and we will report the truth.

Thank you, Mr. Chairman.

Mr. CONYERS. Thank you very much, Doctor. We appreciate that.

Our next witness is George Martin, who is the National Football League's all-time leader in touchdowns. And it goes on from there, for quite a long time here.

Are you still playing?

Mr. MARTIN. No, sir.

Mr. CONYERS. Last year, George Martin walked across the country to raise money for medical care for the first responders to the

September 11, 2001, terrorist attack. He raised close to $3 million for the families.

And, just this month, he was elected to be executive director of the National Football League Alumni Association.

And we will put all of your resume into the record.

[The information referred to follows:]

George Martin

George Martin (born February 16, 1953 in Greenville, South Carolina) played his entire career in the National Football League for the New York Giants (1975-1988), missing only six games in those 14 years (not counting games not played in because of strikes). He played college football at the University of Oregon in the then Pacific-8 Conference and was drafted by the Giants in the 11th round of the 1975 NFL Draft (262nd pick overall). He was a part of the 1986 Giants team that won a franchise record 14 games. In January 1987, Martin was one of the team captains for the Super Bowl XXI champions; late in the second quarter, Martin sacked Denver QB John Elway in the end zone for a safety, cutting the Broncos' lead to 10-9 (which would remain the score at halftime).

In November 1985, Martin became the NFL's all-time leader in touchdowns scored by a defensive lineman (DL), with 5, when he returned an interception for 56 yards against the St. Louis Cardinals. (He had previously been tied at 4 with former Dallas Cowboy defensive tackle Bob Lilly.) In the following championship season, Martin became the league's career leader in TDs scored by a defensive lineman (at 6) when he returned an interception for 78 yards and 6 points (also against Denver's Elway), a feat which Giant head coach Bill Parcells has called the "greatest football play I've ever seen." In addition, Martin amassed over 90 quarterback sacks in his Giants career (his official NFL total is 46; the Giants credit him with 96), during which time he was generally regarded as one of the league's most feared pass rushers. In 2004, he was inducted into the Sports Hall of Fame of New Jersey.

Last year Martin walked across the country to raise money for medical care for the first responders to the September 11th, 2001 terrorist attack. He raised close to $3 million for the the families.

Earlier this month George Martin was elected by a six-person search committee who considered more than 140 candidates, to be the executive director of the NFL Alumni Association. The group hopes to represent the interests of retired players, especially with a new collective bargaining agreement on the horizon. He hopes to unify the various - and often quarreling - groups that claim to speak for ex-players and push the NFL and the Players Association to improve what many former players say is an inadequate pension and disability plan

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Mr. CONYERS. And we welcome you on that note. We are very proud to have you here, sir.

TESTIMONY OF GEORGE MARTIN, EXECUTIVE DIRECTOR, NFL ALUMNI ASSOCIATION

Mr. MARTIN. Thank you, sir.

Chairman Conyers, distinguished Members of the House Judiciary Committee, my fellow colleagues, Commissioner Roger Goodell and Executive Director DeMaur Smith, I sincerely consider my presence here today to be both a privilege and an honor: a privilege in the fact that, for a moment, I have a respected platform on which to bring a rather alarming issue to light from an extremely unique perspective; and honored by the fact that I represent a constituency that will be observing the outcome of these hearings from more than a casual perspective. Therefore, I applaud these proceedings, and hopefully they will represent the impetus and serve as the catalyst to effect greater and even more meaningful responses to an ever-growing medical phenomenon.

As executive director of the NFL Alumni Association, the recent medical findings surrounding head trauma in the NFL in general, and concussions more specifically, though admittedly inconclusive, has sparked sharp debate and generated considerable interest within this industry.

While we, as concerned representatives of the Alumni Association, find the initial medical research alarming, to say the least, unlike my other esteemed colleagues here today—and with all due respect, I am the only one here that can give direct and actual firsthand accounts of the violence and the often injurious aftermath of professional athletics, which, in some cases, leads to an accelerated diminishing physical and mental capacity and sometimes fatal human collateral.

As a former defensive lineman in the NFL for the last 14 years, I have had the unenviable experience of enduring life in what is commonly referred to as the "NFL trenches." And, unfortunately, during that era, when violent tactical maneuvers such as head slaps, forearm shivers, clothesline tackles, and violent head-butts were commonplace among all facets of football, although most have since then been eliminated, the resulting severity of these combative interactions were oftentimes trivialized and minimized by the powers that be, usually referring to such incidents as simply "getting your bell rung," "getting your clock cleaned," or "having cobwebs in your bonnet."

You may ask the obvious question as to why: Why refer to such antiquated and archaic behavior that has long since been banned from use in professional athletics? The answer is rather simple. Though the practice of such brutality has long since vanished, the resulting delayed consequences remain present and are feared to be more prevalent and widespread among our aging NFL alumni population than any of us dared realize.

Today we acknowledge that such blunt force trauma is inherently dangerous and, according to several recent studies, most notably the Center for the Study of Traumatic Encephalopathy, CSTE, of Boston University's School of Medicine, is that such incidents can perhaps lead to premature death among athletes.

The sum total of such medical afflictions such as chronic traumatic encephalopathy, CTE, cannot be accurately measured merely by commissioning a single study, as the all-encompassing illness

adversely affects each and every family member who happens to be associated with the victim or the patient.

I reluctantly highlight this point by betraying a confidence of a very personal friend who, over the course of a professional lifetime, has meant the world to me as a mentor, a teammate, a business associate.

After 10 seasons in the NFL as a highly respected running back, this gentleman retired, seemingly to be the picture of health. He diligently maintained a rigorous regiment of athletic activities, while playing competitive tennis for at least 3 days a week. He also maintained a healthy diet, and he never varied five pounds above or below his optimum weight.

Additionally, he owns a string of fast-food franchises consisting of more than 40 stores throughout the Northeast region. Business travel, both domestically and internationally, was a necessity and frequent occurrence. To say that he maintained an active lifestyle would have been an understatement.

There were no overt signs of diminished capacity in his lifestyle except for, one fateful day, after returning from a business trip, he simply forgot where he parked his car. Upon sharing the story with his friends, we all had an amusing laugh at his expense and naively chalked it up to simple happenstance. He himself would jokingly say on numerous occasions, "George, I guess I got hit too many times in the head."

This incident happened only 2 short years ago. However, within the span of 24 months, this once vibrant, hyperactive individual has been reduced to a mere shell of his former self, who is now confined to self-imposed house arrest and, with each passing day, slips further and further away from the dynamic personality that we all once knew him to be.

The shame, the embarrassment, the degradation are but the tip of the iceberg that he and his family are painfully enduring each and every passing day. This unfortunate scenario rings as a far too familiar refrain among many NFL alumni.

If my presence here today and my very public betrayal of this deeply confidential situation of my former NFL colleagues results in illuminating this potential catastrophic medical calamity, then I would conclude that neither have been in vain.

The general consensus among most NFL alumni centers around four primary concerns: First and foremost, prevention, so that the perpetual cycle of reoccurrence of these situations in sports itself is severely diminished or, better yet, totally eliminated through innovative rule changes and enhanced protective equipment.

Secondly, proper diagnosis and effective medical treatment without laborious and agonizing red tape that oftentimes become a painful prelude that is discouraging and is completely exacerbating an already dire situation.

Thirdly, that such medical treatment not result in a financial catastrophic tsunami which predominantly wreaks havoc, financial havoc, on the surviving family.

Finally, a more comprehensive study which should include a veritable cross-section of alumni in order to accurately determine the full extent of the problem among retirees who may be predisposed to this insidious, debilitating medical situation.

On behalf of the NFL alumni, we greatly appreciate this forum in which to state our position on this vital manner. Thank you, Mr. Chairman.

[The prepared statement of Mr. Martin follows:]

PREPARED STATEMENT OF GEORGE MARTIN

Statement of George Martin, Executive Director of the NFL Alumni Association

Chairmen Conyers, distinguished members of the House Judiciary committee, my fellow colleagues Commissioner Roger Goodell, and Executive Director DeMaurice Smith. I sincerely consider my presence here today to be both a privilege and honor. A privilege in the fact that for the moment I have a respected platform of which to bring a rather alarming issue to light from an extremely unique perspective, and honored by the fact that I represent a constituency that will be observing the outcome of these hearings from more than a casual perspective. Therefore I applaud these proceedings as hopefully they will represent the impetus, and serve as the catalyst to effect greater and more meaningful response to an ever-growing medical phenomenon.

As Executive Director of the NFL Alumni Association, the recent medical findings surrounding head trauma in the NFL in general, and concussions more specifically, (though admittedly inconclusive), have sparked sharp debate and generated considerable interest within this industry; While we as concerned representatives of the Alumni Association find the initial medical results alarming to say the least. Unlike my other esteemed colleagues here today and with all due respect, I am the only one here that can give direct and actual firsthand accounts of the violence, and oftentimes injurious aftermath of professional athletes, which in some cases leads to accelerated diminished physical and mental capacity, or fatal human collateral.

As a former defensive lineman in the National Football League for 14 seasons, I have had the unenviable experience of enduring life in the commonly referred to "NFL Trenches", and unfortunately during an era when violent tactical maneuvers such as head-slaps, forearm shivers, clothes-lines tackles and violent head butts were commonplace among all facets of NFL football; although most have since been eliminated. The resulting severity of these combative interactions were oftentimes trivialized and minimized by the powers that be, usually referring to such incidences as simply "getting your bell rung, getting your clocked cleaned, or having cobwebs in your bonnet".

You may ask the obvious question as to "WHY"? Why reference such antiquated and archaic behavior that has long since been banded from use in professional athletic? The answer is rather simple, though the practice of such brutality has long since vanished; the resulting delayed consequences remain present, and are feared to be more prevalent and widespread among our aging alumni population than any of us dared realized.

Today we acknowledge that such "Blunt Force Trauma" is inherently dangerous and according to several recent studies, most notably *the Center for the Study of Traumatic Encephalopathy (CSTE), at the Boston University School of Medicine, is that such incidences can perhaps lead to premature death among athletes.*

The sum total of such medical afflictions such as Chronic Traumatic Encephalopathy (CTE) cannot be accurately measured merely by commissioning a single study, as the all encompassing illness adversely affects each and every family member who happens to be associated with the victim or patient.

I will reluctantly highlight this point by betraying a confidence of a personal friend who has over the course of a professional life-time, meant the world to me as mentor, teammate and business associate. After 10 NFL seasons as a star running back, this gentleman retired as seemly the picture of health. He diligently maintained a rigorous regiment of athletic activity, while playing competitive tennis three to four times a week. He also maintained a healthy diet, and never varied 5 lbs above or below his optimum weight. Additionally, he owns a string of fast food franchise consisting of more than 40 stores throughout the northeast region. Business travel both domestically and internationally was a necessary and frequent occurrence. To say that he maintained an active lifestyle would have been an understatement.

There were no overt signs of diminished capacity in his life style, except one fateful day after returning from a business trip he simply forgot where he parked his car. Upon sharing the story to us his friends, we all had an amusing laugh at his expense and naively chocked it up as simple happenstance. He himself would jokingly say on numerous occasions "George, I guess I got hit in the head a few too many time". This incident happened only two short years ago. However, within the span of 24 months, this once vibrant, hyper active individual, has been

reduced to a mere shell of his former self, who in now confined to self-imposed houses arrest, and with each passing day slips further and further away from the dynamic personality that we all once knew. The same, embarrassment and degradation are but the tip of the iceberg that he and his family are painfully enduring each and every passing day. This unfortunate scenario rings a far too familiar reframe among many NFL alumni.

If my presence here today, and my very public betrayal of this deeply confidential situation of a former NFL colleague results in illuminating this potentially catastrophic medical calamity, then I would conclude that neither have been in vain.

The general consensus among most NFL alumni centers around four primary concerns.

1. First and foremost "Prevention". So that the perpetual cycle of reoccurrence of these situations in the sport itself is severely diminished or better yet, totally eliminated through innovative rule changes, and enhanced protective equipment.

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3. Thirdly, that such medical treatment not result in a financially catastrophic tsunami, which predominantly wreaks financial havoc on the surviving family members.

4. Finally, a more comprehensive study which should includes a veritable cross section of alumni, in order to accurately determine the full extent of the problem among retirees who may be predisposed to this insidious debilitating medical condition.

   On behalf of all NFL Alumni, we greatly appreciate this forum in which to state our position on these vital matters

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Mr. CONYERS. That was very moving, and I am glad that you were here to tell it.

Mr. MARTIN. Thank you, sir.

Mr. CONYERS. Merril Hoge, former Pittsburgh Steelers, was the team's starting running back for six seasons. He set the team

record for the most receptions by a running back, totaling 50 in 1988. But he suffered his first concussion with the Bears during the 1994 season, in a game in Kansas City, and he was back playing 5 days later.

But when he suffered his second concussion 6 weeks later, it ended his career. He had to relearn how to read. Sometimes get lost coming home from a restaurant that he had frequented for years. He is now an analyst for ESPN national—an NFL analyst. And even, sometimes, things can trigger problems about concentration, and so forth.

We are very proud to have you with us. We realize because of time constraints, and we received the concurrence of the Ranking Member, to take you from the second panel and put you on the first panel. And we are very pleased that you are here to talk with us today.

TESTIMONY OF MERRIL HOGE, RETIRED NFL PLAYER

Mr. HOGE. Thank you, Chairman Conyers. I appreciate that. And, Ranking Member Smith and Committee Members, it is an honor to be here.

As mentioned, I played 8 years in the National Football League: 7 for the Pittsburgh Steelers and 1 for the Chicago Bears. In the prime of my career, a series of concussions cost me my career and nearly took my life.

After my second concussion, I was escorted into the training room, where I flat-lined. As they started to resuscitate me, I popped back up, and they rushed me to the emergency room, where I lay in ICU for 2 days. In the first 24 hours, I could not recall my wife, my daughter, or my brother, who were there at the time.

I was confined at home for weeks, where I couldn't leave unless somebody went with me. I had to learn how to read again. I went through depression. And these major symptoms took nearly 2 years to recovery from.

Two things went wrong from my first concussion on a Monday night game in Kansas City: First, I never saw a neurological doctor. Second of all, I was cleared 5 days later to play the game of football over the phone by a family practitioner.

Now, due to contrary testimony already, I will say this. There has been significant changes in the National Football League based on the NFL and the NFLPA. What happened to me would not happen in the National Football League today. That does not mean we are all the way there. We are on our way.

Something that is also extremely important that we all understand, and that is why we are here: The brain is the most vital and sensitive organ in our bodies. Without it, we do not function, we do not operate.

That is why I am going to kind of broaden the scope, Mr. Chairman, and ask that you help us establish a national standard. Part of that national standard—and this is where it can be somewhat of a calming and a soothing approach to this—is that the standard be a part—part of the standard being that a neurological doctor is always part of the evaluation of head trauma, somebody who is trained for that. Secondly, within this national standard, that a player, he or she, does not return to play their particular sport

until they are asymptomatic for 7 consecutive days at exertion and at rest after they have cleared. If we established just those standards with all football, we would have less tragic stories than we have to this point.

Now, as I broaden the scope just a little further, let me include our youth programs. Youth football from ages 6 to 14, we have over 3 million kids playing football. That is twice as many that exist in high school, college, or the NFL combined. And we cannot forget them.

The reason I am somewhat adamant about this at this point, I am a youth coach; I am active in youth football and other sports. I am the head coach, I am the trainer, I am the equipment manager, I am the cheerleader, I am the psychologist all in one and especially in the early moments of injuries. My experiences have truly helped me in critical moments in these programs, but oftentimes I watch the sidelines with uneducated parents dealing with our youth. And it is a grave concern.

Within that standard that I am trying to propose is because I have never been a part of a program where there is a standard or a protocol to head injuries; that if we were better educated in that fashion, we would have less tragedies. So I am asking you to help us with that. Help us create better standards, better requirements, and better education.

And that we don't overreact, that we promote athletics, we promote activity. What is one of the biggest concerns that we have in our youth today within our society? It is obesity, the health care issues that exist with that. So we cannot say because of head trauma and concussions we must eliminate sports. We must educate, we must properly evaluate and properly take care of those athletes. If we do that and create a safety, that will encourage more youth to be involved in our sports, that we are properly taking care of them and educating them.

Now, I have met many times with Roger Goodell. My words have not fallen on deaf ears. He has been genuine, sincere, and committed to this issue and the health and benefit issues of our former players. I have also met with DeMaur Smith many times. My words have not fallen on deaf ears. He is also genuine, sincere, and committed to helping this issue and our former players.

And I address them for just a second. They are the people that we cannot forget. They are the ones that created the stage that I was fortunate enough to play on. I was part of building a stage that the current player is playing on. And the current player is continually building the stage in the National Football League that future players will build on.

But, eventually, all will be retired players. And, too many times, the NFL and the NFLPA has made it too difficult on our retired players to get the proper care that they deserve. Being here today gives me great hope that we may bridge the gap, not only on this particular subject with brain trauma, but the health care and the health issues that exist in the NFL.

Commissioner Conyers, I want to thank you for having me here, and the rest of the Committee. Thank you for your time.

[The prepared statement of Mr. Hoge follows:]

PREPARED STATEMENT OF MERRIL HOGE

The Testimony of Merril Hoge before the House of Representatives Committee on the Judiciary hearing entitled "Legal Issues Relating to Football Head Injuries."

Chairman Conyers, Ranking Member Smith, and the Committee, I am Merril Hoge and I played professional football for the Pittsburgh Steelers and Chicago Bears. I competed in the National Football League from 1987 through 1994 and traumatic brain injuries prematurely ended my professional football career. The following key points related to head trauma and the need for the standardized treatment of brain injuries will be addressed in my testimony before the Committee. Thank you for the opportunity to testify and I look forward to you questions.

- First I will discuss what happened to me in my personal experience with head trauma and how effected my career and life.
- I will also address what I believe went wrong in the care process with those concussions how that could have been improved and potentially save my career.
- I will provide reference to how delicate and vital the brain is and why we should protect it.
- I will ask for help creating a national standard for dealing head trauma in sports.
- In addition to being a former professional athlete, I speak from the perspective of a Youth Sport Coach concerned about a standard that could protect athletes in each sport that I have coached including football.
- I ask the members reviewing this issue to help make sport in America safer with requirements on education about caring for all sport related injuries including concussions.
- I believe we must not overact by trying to take away athletics from those that want to play. We must work to promote activity to combat the problems with obesity in children that we are currently dealing with in American children.
- My meetings with Roger Goodell and DeMaurice Smith have gone well. Both seem interested in this issue.
- Finally I believe there is a need for the NFL and NFLPA to come together to work together on addressing this issue.

Mr. CONYERS. Well, thank you very much.

I have three questions. But you referenced the uneducated parent. And I am not a very sensitive person, but would you describe that uneducated parent with a little more specificity?

Mr. HOGE. Chairman Conyers, I actually would, and it is a great question. And I have a great example that just happened several weeks ago. And may I broaden the scope a little bit from the

uneducated parent to the uneducated coach that works our youth sideline?

I had a young kid named Griffin who got up from a collision and he was a little woozy. So he had sustained some type of head trauma. As I pulled him to the side, ironically, his older brother Jake helps coach. He is 25 years old. Now, Jake obviously knows Griffin much better than I, although I know Griffin very well. I wanted to address what was going on with Griffin. I wanted to talk, I wanted to address a lot of cognitive things that I am aware of now, from retrograde to anterograde, to his name, to what play we just ran, to find out where his senses were, looking at his pupils—some of the things I know. Then I asked Jake to sit there and talk to him and make sure that these didn't elevate from sickness to dizziness.

Well, after 5 minutes, Jake ran up to me, and he said, "Grif is ready to go back in." And I am like, "No. Grif is done playing." I just wanted to make sure that the symptoms did not elevate so that we could get him to the hospital, then after the game talk to his parents about monitoring him and taking him to the doctor if necessary.

The caution and concern that I have there is Jake could very easily be a head coach in our youth program, and he was willing to put his own brother back on the football field, purely out of ignorance. And I understand that because me being 25 years old and being Jake and the lack of experience I had at that time, I probably would have done the same thing.

And that is why I think standards and education would help mistakes being made like that.

Mr. CONYERS. Thank you so much.

My three questions are these.

Commissioner Goodell, is there a link between playing professional football and the likelihood of contracting a brain-related injury such as dementia, Alzheimer's, depression, or CTE? And I also may ask Dr. Cantu to comment on it.

My second question is, Commissioner Goodell and Executive Director Smith, will you agree today to open up your books, records, files, personnel of the league's, its teams, so that we may conduct an independent examination concerning brain-related diseases?

And, Madam Dr. Culverhouse, how does it make you feel to see your former players suffering from the repercussions of poor choices made to prematurely put players back into the game after injuries?

Mr. GOODELL. Chairman, let me address your first question.

You are obviously seeing a lot of data and a lot of information that our committees and others have presented, with respect to the linkage. And the medical experts should be the one to be able to continue that debate.

But our bottom line is, we are not waiting for that debate to continue. We want to make sure our game is safe, and we are doing everything we possibly can for our players now. And that is why we have engaged aggressively in making changes to our game. We have done some of the things that have been discussed here on a variety of levels.

Let's start with the fact that we have made significant rule changes to our game. Five rule changes this year alone have been

made that I think are improving the safety and welfare of our players. They have had a positive impact in the short term that they have been in place. And we will continue, as we have done every year, to evaluate rule changes to make our game safer.

Many of those changes this year were specific to head injuries and making sure that we take certain techniques out of the game that can be unsafe for our players, both in the short term and potentially in the long term.

We have also engaged very aggressively on education. We have worked with the Players Association, with our medical doctors to create information that we can share with our players and also with players at other levels. It is a very important responsibility to set the right——

Mr. CONYERS. Well, you have testified to that. But I just asked you a simple question. What is the answer?

Mr. GOODELL. The answer is, the medical experts would know better than I would with respect to that. But we are not treating that in any way in delaying anything that we do. We are reenforcing our commitment to make sure we make the safest possible deal for our——

Mr. CONYERS. All right. Okay. I have heard it.

Dr. Cantu?

Dr. CANTU. Sir, in the world's literature, the majority of chronic traumatic encephalopathy has been reported in boxers, and it is reported at a younger age in boxers because they probably take more head trauma than any other sport. But it is not confined to boxers. Obviously, we are here today because of this same entity due to head trauma in the NFL, but it has been reported in a soccer player, it has been reported in rugby. It has been reported in individuals that have head-banging disorders. It has been reported in a clown that got shot out of a cannon in a circus, and every time he got shot out of the cannon it was like being concussed.

So, as I indicated, yes, I think there is cause and effect. It is not unique to the NFL, though.

Mr. CONYERS. Of course.

Commissioner Goodell and Director Smith, will you let us see the records?

Mr. GOODELL. The answer to that question is absolutely yes. We first discussed this between the NFL and the NFLPA back last spring. We are going to make all medical records available to them. And we, of course, will do that for the Committee.

Mr. SMITH. Yes, sir, of course we will.

Mr. CONYERS. Thank you.

Dr. Culverhouse?

Ms. CULVERHOUSE. Yes. As one could imagine, my children were involved in football early on. I have a child born in 1972, 1973, and 1974. So they went with me to games, and they developed favorite players, players that took the time to give a handshake to my son or give my daughter a ride on his shoulders.

In January, I learned that one of those players who had stayed in Tampa, Tom McHale, and started a successful business, was dead.

Batman Wood, my son's favorite player because he wore bats on his shoulders and his elbows and his knees and my son could pick him out, was getting lost trying to drive home from Starbucks.

And I met with Batman and heard about his story and asked him about another player that we had really liked, Jerry Eckwood. And he said, "Gay, Eckwood is really bad. He is really bad." And I said, "I have to find him, because I need to help him."

Same thing with Scott Brantley, a former Gator—I am big on Gators—but a former Gator. And Scott Brantley is in—Scott Brantley is in big trouble now. And he said to me this morning as I was coming over here, he said, "Gay, you have always been a rebel, but you are a rebel with a cause. Make them hear that we are hurt. Make them hear that we can't fill out all of their forms. We can't do it. Our mental capacity isn't there to answer the questions on the phone and fill out the forms. They are missing those of us that are severely disabled."

And so what I am doing with Randy Grimes and a number of my players is I am filling out the forms, I am going through the networks for them to access the benefits that they may be entitled to—which are not enough to sustain them monetarily. They are not enough. Five thousand dollars for a hip replacement is not enough. I just had my knee done; I can tell you that for a big fact.

But we have to get proactive for these players. So I am going to Little Rock, Arkansas, to find Jerry Eckwood to take him to the doctors myself and fill out the forms to get this man the help he needs. I don't want to read about another one of my players that is dead. I don't want to have to tell my children their favorite gentle giant is dead. This isn't working for me.

Mr. CONYERS. Our Ranking Member, Lamar Smith.

Mr. SMITH OF TEXAS. Thank you, Mr. Chairman.

Mr. Chairman, I would like to address my first question to Mr. Goodell, Dr. Tucker, and Mr. Martin. And I know you all will come at the answer from different perspectives.

Mr. Goodell, you may want to address ways that you and the Players Association can cooperate or new rules that might come up.

Dr. Tucker, you might address equipment.

Mr. Martin, you might have some comments from your own personal experience.

My question is this. We have discussed a lot today about the problems. We have discussed a lot about past actions that have been taken. My question is, what future actions should we take? What are the next steps to advance our understanding of the problem of head injuries, to try to improve treatment and to try to increase prevention of these head injuries?

So, even though you have different perspectives, if you will talk about the future as opposed to the present or the past.

Mr. Goodell?

Mr. GOODELL. Well, let me try to address that as concisely as I can without repeating a lot of the testimony.

The first thing we have to do is continue to support this research and make sure we put more and more into this research so that we can find out what exactly are the medical facts. That is first, and we will continue to do that.

The second thing we are going to have to do is to continue to prevent these injuries in the best way we can. That is rule changes that we have instituted that are making a difference. Second is we made some—because of the research we have done, made some very important changes to the equipment, particularly in the helmets and the chin straps.

And these are important changes for us in making the game safer.

The other issue that I would say is the education. I think the big issue for us and for every player at every level and in every sport, as was pointed out here, is to make sure they are aware of the issues that come when you have a concussion. And it is a serious injury, and you have to take it seriously and get medical care.

Mr. SMITH OF TEXAS. Okay. Thank you, Mr. Goodell.

Dr. Tucker?

Dr. TUCKER. At the risk of repeating some of the testimony, I will speak a little bit more specifically to equipment.

We have made mention that research has shown that at least concussions that occur in the NFL frequently occur in blows to the side of the head and to the facemask. This information was given to the helmet manufacturers, and they responded with change—the first changes in many, many years.

The new helmets that have been rolled out in the last handful of years at least test better in the laboratory. So we are optimistic that the forces being imparted to the brain are showing that they are decreased compared to the older helmets. It won't eliminate concussions, but if we can decrease the risk we will feel good about that.

It will take more time and more study and more meticulous tracking of these injuries, which we have been doing for a lot of years, to figure out whether the new helmets actually decrease risk of concussion or the actual occurrence of concussion in the National Football League.

Interestingly, over the last one to two seasons, the number of concussions diagnosed and recorded have actually dropped slightly, but I wouldn't make too much of that. I think it is premature to say.

Mr. SMITH OF TEXAS. Okay. Thank you, Dr. Tucker.

Mr. Martin, any practical advice you have for us?

Mr. MARTIN. Yes, sir, I would like to add this, that I am optimistic that, in this new spirit of cooperation, that we can all come together with a unique plan to address many of these serious issues.

But the three points that I am concerned about, particularly as it relates to a lot of the so-called heroes or our constituents, is that we must make sure that we determine and identify where they are. Because a lot of them, you know, they value their anonymity. And we want to make certain that we have identified them and embrace them in this new era.

Secondly, we want to make sure that all of the splinter or faction groups that currently exist out there are working off of the same goal, to make sure that these are not isolated incidents and we can address them collectively.

So I am very optimistic about this new era and this new platform that we have of recognizing the severity of this. And that is the message I am going to take from here.

Mr. SMITH OF TEXAS. Okay. Thank you.

I have to ask you a quick question. How much touchdowns did you score on the interceptions or fumbles?

Mr. MARTIN. I have a total—and I will speak to Mr. Goodell about this. I held the record for most touchdowns by a defensive lineman, which was seven. However, I have one touchdown as an offensive lineman, which would make it eight. So I don't know how you——

Mr. SMITH OF TEXAS. We will correct the record.

Mr. MARTIN. So it is eight, sir.

Mr. SMITH OF TEXAS. Thank you.

Dr. Weir, my last question is for you, and that is in regard to the University of Michigan study by the Institute for Social Research. How was your study misrepresented, and what impact has that had on the discussion and debate?

Mr. WEIR. I believe, as I said in my testimony, it has been misrepresented to the extent that it is asserted there is a certainty that there is an elevated risk demonstrated by our study, which I don't believe there is.

What is the harm in that? To the extent it focuses us on safety, who is going to be against that? My concern, and I think Mr. Hoge raised this very well, we have an epidemic of obesity among children. Do we want to tell prospective junior athletes there is a 19-to-one risk of dementia if you participate in sports? I think that is a very damaging kind of thing to have out there without really good scientific support for making it.

So that would be my main concern, is that we are possibly frightening people away from healthy participation in things they should be in.

Mr. SMITH OF TEXAS. Thank you, Dr. Weir.

Thank you, Mr. Chairman.

Mr. CONYERS. Mel Watt, North Carolina, distinguished Member of the Committee.

Mr. WATT. Thank you, Mr. Chairman. And let me thank the Chairman for convening this hearing. It has been very enlightening.

And I especially want to express my thanks to the last two witnesses, the former players in the NFL, for the very balanced approach that they brought to their testimony.

Maybe I could get Mr. Smith to cut his microphone off over there. Thank you.

I am also a big NFL football fan, and certainly observed the change that has taken place in attitude about this issue. I am a big Carolina Panthers fan and observed the Dante Wesley hit that got him suspended and knew in my own mind that, several years ago, the response to that would have been a 15-yard penalty and that would have been the end of it. So I understand that there is a change of attitude taking place here.

And the one thing that I try to discern out of these hearings of this kind is what kind of public policy direction we might take. So I am extremely appreciative to the last two witnesses for their bal-

ance on that. Because, after all these years, we still haven't taken any steps to outlaw or ban boxing. And I don't think we are likely to take any steps to outlaw or ban football. So we have to look at what the possible adjustments are, short of that, that may be made either within the sport or from a public policy perspective.

The one thing that I kept wondering about throughout the testimony, particularly Mr. Goodell, Dr. Culverhouse, Mr. Martin in particular, there seem to be financial incentives that discourage athletes from being honest about their own condition, even if they are capable of discerning their own condition. All of the counterpressures are there for them to get back into the game and be able to perform because there are financial incentives associated with that.

Is there a policy in place already in the NFL, or is there some kind of policy that you all might be able to think of, that would minimize or eliminate that financial incentive by assuring that a person who is diagnosed with a concussion and has to miss a game as a result of the standards that I think Mr. Martin or Merrill Hoge outlined—is there some way to build a contract necessity that would shield those players against the consequences of the medical conditions that they incur?

Mr. Goodell, Ms. Culverhouse, I would be particularly interested, and Mr. Martin, in your response to that.

Mr. GOODELL. Well, I would be happy to start.

First off, you do identify an issue. Self-reporting of concussions has been an issue. And we have, I think by the education that we have jointly done with the Players Association and with the Player Advisory Committee, I think——

Mr. WATT. You are evading the question again, Mr. Goodell. I asked you about contracts.

Mr. GOODELL. Well, let me address that directly then, on the contracts. If a player misses a game because of a concussion, he is still paid. So the athlete still gets paid.

Mr. WATT. But there are financial consequences at the end of the contract, the incentive compensation for games played, for—that there are economic consequences that flow from that. Is there a way to protect against that?

Mr. GOODELL. There may be some incentive contracts that would be hindered by that, depending on the length of time the player was out. It would be something we would have to discuss with the Players Association and try to see if there is a way to address that.

Mr. WATT. Mr. Martin? Dr. Culverhouse? And my time has expired. So I just won't interrupt you in your response.

Mr. MARTIN. I will take a stab at it. I am not quite sure I have the answer to it, Mr. Watt, but I appreciate the question.

I am not quite certain if you can disincent an athlete because of his predisposition to want to go out and perform. I am not sure how you protect both his financial incentive to want to go out and perform in light of being injured versus disincenting him to protect him from the injury. That is a difficult question, and I am afraid I don't have the answer.

Ms. CULVERHOUSE. I can say that it would be very difficult for the NFL to mandate to the owners how to structure their contracts. That would be a difficult thing, as I can tell you that owners are

like a bunch of mavericks, and it would be very difficult to mandate to them how to have their players paid. Because incentive bonuses are the way you get those players back in the game and you win.

They don't molly-coddle. This is a business. It is a blanking cutthroat business. The bottom line is making money. And if their player ain't playing and the team is losing, that is the bottom line.

Mr. WATT. Thank you, Mr. Chairman. I went over. I yield back.

Mr. CONYERS. Senior Member Bob Goodlatte.

Mr. GOODLATTE. Well, thank you, Mr. Chairman.

Mr. Chairman, I would like to direct my questions primarily to Mr. Goodell and also to Mr. Smith. And it regards, first of all, the problem that has been very, very well-described by everyone on this panel today in terms of the risk of these head injuries and the fact that this is something that starts becoming a problem at a very young age, in junior high school, high school, on up through college, and long before they get to the NFL.

There are a number of good ideas that have been expressed. Mr. Hoge had some very good ideas regarding neurological examinations and with regard to 7 days, staying away from the football field until they are asymptomatic for at least 7 days. And I am sure there are a number of very good ideas that medical experts and coaches and others could offer in this regard.

But one of the problems is getting the information out. I am not sure that, given the wide variety and changing opinions, that this is suitable for legislation from the Congress.

But I am wondering, does the NFL during games use public service announcements, for example, to educate young people and their parents about the risks of head injuries and things that could be done on a practical basis to avoid them in Little League play and in high school and so on?

Mr. GOODELL. The answer to that question is, I believe we have used public service time. We could probably use more on this.

But I would tell you that the most important thing is, we set the example on the NFL field. We saw just this past Monday night when we had Brian Westbrook, a player, go down in a game with a concussion. He was taken off the field. He did not come back to the game. And it was done in a very cautionary and conservative way.

And I think that is the message we need to send to people. And we will look at the idea of whether we can give more public service time——

Mr. GOODLATTE. I missed that play. Did it involve a play that required a penalty or some other action on the part of the referees to indicate that this injury was sustained because of inappropriate activity, or was it simply——

Mr. GOODELL. It wasn't an inappropriate activity. It was actually just a knee that hit to the back of a player, which happens in our game and in other sports.

Mr. GOODLATTE. Well, I mean, I wonder if you would review the policy you have. I see many public service announcements that promote various things on the broadcasts of professional sports. And you could work with the broadcast companies to promote greater information, just promoting the very ideas that Mr. Hoge promoted.

And, Mr. Smith, I wonder what you think about that but also what involvement the Players Association has in promoting getting that kind of information out to young people and their parents. Do you favor having greater contractual requirements for the players to actually get out and, whether voluntarily or as a part of their contract, be more engaged in communities around the country to promote this kind of safety?

Mr. SMITH. Congressman, our players are doing that right now. And I think, to answer your question succinctly, I think there are four or five things that we can actually do and, I am proud to say, we are doing.

Our players in the National Football League, I believe, should be the model. I think that Commissioner Goodell is right, we have an obligation to set the standard. That standard is the standard that will be followed in college, it will be followed in high school, and it will be a role model for youth football. Both of us are vitally involved in the USA Football movement. We use that vehicle not only to encourage youngsters to play football but to do it safely.

Third, our players are also a number of the individuals who end up being coaches, not only in the National Football League, but coaches on the college level, coaches on the high school level, and, as Merrill indicated earlier, coaches on the youth football level. So having our players understand and embrace all of the information to make safe choices is yet another way, in addition to PSAs, that we can get the message out.

Lastly, we do a tremendous amount of work on the Players Association to get players to appreciate the best and the right helmets to wear. We believe that if we advise the players and give them all of the information, the most up-to-date information, urge them to wear specific helmets, that is yet another way that we serve to set the right example and to get the information out to the people that you mentioned.

Mr. GOODLATTE. Thank you.

It sounds like both of you are very committed to trying to reduce these injuries, not only within the NFL, but in the sport of football at large. And I think getting that information down particularly to parents and coaches at the high school level and college level is very, very important.

And I think you could both use more resources than are devoted to it now to play a major role in that, since you are the ultimate beneficiaries of that entire system that finds and recruits the finest football players, gets them into the NFL, and gives them the opportunities that they have and that all Americans have to enjoy professional football.

Wouldn't it be the best path forward for the problems in the NFL itself for the private parties to come up with the best solutions? Are either of you arguing that the Congress should be making this decision? And, if so, why?

Mr. GOODELL. We are not arguing that. We think that we have pushed research, we have pushed education. We have made changes to our game, to the equipment.

We have made significant changes, which I am happy to put into the record, with respect to the management of concussions. I think we are doing a terrific job and a much better job, much improved

job of conservatively treating concussions and managing them when they occur so we don't have incidents like Merrill Hoge spoke about before.

So I think that we are doing a job that is important because these are serious injuries, and we need to continue to make advances.

Mr. SMITH. Congressman, we don't believe that legislation is the only answer. One thing that we all know, just by all of us being brought here today, is this great body not only can spark public debate and serve to inform, to better the lives of everybody through legislation, but also by having these hearings.

We have talked a lot today about a University of Michigan study. But one of the things that will be entered into the record is the fact that, over the last 10 years, there have been hundreds of studies on this issue that have talked about the links between on-field head trauma and the early onset of a number of mental illnesses.

So while we are here, perhaps, because of the recent articles and the news that has come out about a number of players, the reality is, over the last 10 years, there has been study after study after study after study.

And I do believe, to go back to your earlier point, how can we do a better job? That is to understand and embrace these studies as being game-changers and player safety and getting that information out to all of the—not only the kids who will play football from youth football going forward, but to the coaches and to the parents who gladly have their kids be involved in physical activity.

Mr. GOODLATTE. Thank you.

Thank you, Mr. Chairman.

Mr. CONYERS. Thank you very much.

Before I recognize Maxine Waters, we are pleased to appreciate the presence of Jim Brown of the Cleveland Browns in the room.

Thank you for joining us, Jim.

Mr. BROWN. Thank you, Mr. Chairman.

Mr. CONYERS. The distinguished gentlelady from California, Maxine Waters.

Ms. WATERS. Thank you very much, Mr. Chairman and Members.

Before I raise a few questions, I would like to submit for the record full disclosure of my husband's affiliation with the National Football League, having previously played for at least three teams: the Cleveland Browns with the great Mr. Jim Brown; Pittsburgh; and the Washington Redskins.

And so I do have intimate knowledge, based on my interaction with a number of players and owners, about the NFL. Georgia Frontiere was a very close friend. And John Shaw, who was president of the Rams, and Chip, the new owner, are friends.

However, having said that, I remain extremely concerned about the plight of football players, particularly some of the older ones who worked and played when times were even a lot more difficult for players.

Let me just ask Mr. Goodell: in the October 2009 issue of *GQ*, we were told the story of Mike Webster, legendary center for the Pittsburgh Steelers from 1974 to 1988. At the height of his career, Mike Webster was publicly revered as an unstoppable titan and

formidable force in the league. And yet, shortly before his death in 2002 at the age of 50, Mike Webster spent his latter years homeless, suffering from dementia, while in a contentious legal battle with the very organization that made him a legend.

The *GQ* article called the legal dispute a battle against a multibillion dollar industry that seemed to have used Mike Webster, allowed him to become destroyed, and then threw him away like a rotten piece of meat.

I bring his case because he had dementia, which obviously was associated with the years that he played. Why could he not get taken care of by the NFL?

Mr. GOODELL. Well, Congresswoman, this was before my time as the commissioner. I will say, and I am happy to say, in our current state right now, he would be eligible to participate in our 88 Plan and would get the benefits of the 88 Plan, regardless of whether that was caused by playing in the game.

Ms. WATERS. How many players do you have out there who are suffering now, or have suffered from, dementia, or from other injuries related to playing football that have not been taken care of because of your benefits packages of the past?

For example, I think you changed it, but I don't know, those people who took early retirement were not eligible for disability. Did you change that?

Mr. GOODELL. Yes, we did. What we did was we opened a window to allow them to come in and to get those benefits. So we opened that window for about a 6-month period.

Ms. WATERS. We know that the NFL and the NFL Players Association are currently renegotiating their collective bargaining agreements. What are you doing in this bargaining that you are involved in now that will deal with the very issue that we are talking about, related to brain injuries and dementia and Alzheimer's and all those other things related to these kinds of injuries? What are you negotiating that will better recognize the injuries and how you are going to take care of them, and their families?

Mr. GOODELL. Let me take the first start at it, and De can contribute to that.

I think both of us have identified that the plight of our retired players is a priority in the——

Ms. WATERS. I can't hear you.

Mr. GOODELL. Both of us have identified in the collective bargaining process that this is a priority for the owners and for the players, to take better care of our retired players.

One of the reasons we conducted the survey that may have been one of the impetuses for this hearing was to identify the priorities that our players need to have addressed. There are multiple issues that need to be addressed, as you point out some of them. Some of them are medical. Some of them are financial——

Ms. WATERS. If you would excuse me, I would like to take back my time. I appreciate where you are going.

We have heard from the NFL time and time again. You are always studying, you are always trying, you are hopeful. I want to know, what are you doing in the negotiations that are going on now to deal with this problem, and other problems related to the inju-

ries that football players obtain, and its impact on their health later on?

Mr. GOODELL. Well, again, we are at the very early stages of negotiations. But I believe that we will be addressing these matters in a responsible fashion, that we will be able to come back before you at some point in time and say that we have addressed these in a way that is responsible.

In the meantime——

Ms. WATERS. Mr. Chairman, I appreciate the opportunity for the hearing.

I know my time is drawing to a close, but let me just say this to Mr. Goodell and everybody who is here today, that I think it is time for the Congress of the United States to take a look at your antitrust exemption. I think that you are a, what, $8 billion organization who have not taken seriously your responsibility to the players.

The fact of the matter is, yes, people want to play. The fact of the matter is they are going to be injured. And we know, no matter what kind of helmet you build, no matter what kind of equipment that you have, it is a dangerous sport and people are going to be injured.

The only question is, what are you going to do? Are you going to pay for it? Are you going to pay the injured players and their families for the injuries that they have received in helping you to be a multibillion-dollar operation? That is the only question.

And I know that you do everything that you possibly can to hold on to those profits. But I think the responsibility of this Congress is to take a look at that antitrust exemption that you have and, in my estimation, take it away.

I yield back the balance of my time.

Mr. CONYERS. I thank the gentlewoman for her modest suggestions.

The Chair recognizes Howard Coble, North Carolina.

Mr. COBLE. Thank you, Mr. Chairman.

And thank you all for your testimony.

Mr. Martin, Dr. Culverhouse, and Mr. Hoge mentioned this in their testimony. What does the alumni association have to say to active pro, college, and high school players about the importance of early and completely presenting to team physicians any symptoms that may have been caused by concussions, knowing full well, as has been pointed out, players are plenty reluctant to do it for fear of maybe losing a college scholarship or losing a lucrative pro contract?

What do you say to that, Mr. Martin?

Mr. MARTIN. Thank you very much for the question, sir.

First of all, I would say that one of the major activities that alumni athletes have is to going back in the community and giving back. And we ourselves position ourselves as examples, both pro and con, both good and bad. And we have a platform that we take very seriously. And it is my job and it will be my responsibility to make sure that that is enhanced, particularly as we are addressing these very serious issues.

The problem and the challenge that we have is disseminating this information among a wide grouping of constituents and that

a lot of our members don't have this information. I think it is vital that they receive it. And once we obtain that information, we have to then be ambassadors to go back, as I said in my earlier point, to make sure that there isn't a propensity of these kinds of things happening down the line. And that will be our charge.

Mr. COBLE. And I am glad to hear you say that.

Mr. Smith, in a recent New York Times piece concerning concussions, a former quarterback was quoted as having said, quote, "They are legislating hitting out of the game," closed quote. We have had the same sort of comment from commentators, often retired players, echoing the same sentiment during television coverage of games.

This suggests, it seems to me, that some of the retired players are concerned that the game is not tough enough anymore as a result of the rules changes made to hopefully protect players. How do you respond to that, Mr. Smith?

Mr. SMITH. Congressman, last weekend, I met with the 40-person congress who represents retired players. They talk about the toughness of the game, but they also talk about the lifelong injuries that they sustained, the loss of their ability to keep a train of thought. When you talk to the Chair of the wives organization, they will tell you a story about players who are unable to move on Monday and Tuesdays. When I watched Brian Dawkins walk down the steps, who is a safety for the Denver Broncos, gingerly walk down the steps on a Monday afternoon—and while I shook his hand and went to embrace him he put up his hand and just said, "Hey." Well, I don't think there is anyone who plays football today who doesn't believe that this is a very, very tough, tough game.

No, we are not looking to legislate hitting out of the game. But, in the same way that this Congress has stepped in historically, whether it was the NCAA almost 40 years ago or whether it was other issues in professional sports, to ensure the safety of the players, this body works when you call a hearing like this, where you ask us tough questions, where we put forth information.

But I do believe that this Congress, this body does have a role in making sure that the people who play this game on the professional level all the way down to the peewee football level are doing so safely.

Mr. COBLE. I thank you, Mr. Smith.

Mr. SMITH. Thank you.

Mr. COBLE. Dr. Weir, as your second study proceeds, what other research would you like to see performed to help better understand why, if at all, football head injuries cause long-term neurological impairments in the players affected?

Mr. WEIR. As best I understand it, the study under way, under the direction of Dr. Ira Casson, should shed interesting light on the progression of head injury cases.

I think it is actually of great importance to compare college athletes and professional athletes to those who did not participate, to look at the risks at each of those levels independently. That will probably require a larger study than that one is.

I know there have been some criticisms of that study because it is being conducted directly under the auspices of the league. I think that could perhaps be addressed by an independent moni-

toring board that could come in and review those protocols, perhaps offer some advice on it.

It would be a shame if that research ended up having no value because it was simply not considered credible. I suspect it will have great value. And that is the kind of study we need, is long-term follow-up of people, where we know what happened to them and we follow them afterward.

Mr. COBLE. Thank you, Dr. Weir.

Mr. Chairman, I see the red light has illuminated, so I yield back. And I thank the panel again.

Mr. CONYERS. Thank you, sir.

The Chair recognizes the distinguished gentlewoman from Houston, Texas, Sheila Jackson Lee.

Ms. JACKSON LEE. Thank you very much, Mr. Chairman. And I thank you and the Ranking Member for this brilliant hearing.

Actually, I would like to acknowledge, Roger, that both you and DeMaurice make a very good pair. And I think you should look at yourselves as part of the 21st-century NFL.

I wanted to make mention, as I begin my questioning, of a meeting that I had this morning with NFL Hall of Famer Jim Brown. And we talked about the value of the NFL, the value of the players, particularly today. We talked about the raging violence among our communities and young men.

DeMaurice, you know you have been with me, and we have addressed this question. We have acknowledged the fact that the NFL is respected and admired. The young men that are a part of this great family that you have can be wonderful role models. And, of course, Mr. Brown is aware of the dire need of mentorship and manhood training. He is in the room today.

And we talked about the idea that I shared with the Attorney General recently that tracks Mr. Brown's program, but it is to build a partnership with the NFL and our government on this whole question of violence and, in particular, young African American men, young men, to create a new revolution in mentoring, to have NFL players out across America in these schools and addressing the question of manhood and how do you be, in essence, a manned-up man but also a compassionate, caring person that does not take up the gun.

Our young people admire all of you. And I want to, myself, pay tribute to Jim Brown, who stayed, so that I could thank him for his genius on the idea of reaching out to young people.

And I am going to, frankly, ask a very quick question to Mr. Goodell. Would you work with us to implement a program that I would like to start with the DOJ and others on this question of violence among our young people?

Mr. GOODELL. Congresswoman, yes, we would. As I said earlier in the testimony, we believe that we set the standard on the NFL level, that our players do, both on and off the field. I have spoken to Mr. Brown about the work that he is doing, and I encourage it. And we would welcome the opportunity.

Ms. JACKSON LEE. Well, I would look forward to it. And I do full disclosure that this separates from the questioning, but this would be something in addition to what you traditionally do, and I do appreciate the fact.

Mr. Smith, would we be able to work with you on this issue?

Mr. SMITH. Absolutely. And you know that I am always happy to work with the Attorney General and to work with you, as we have done in the past. We have challenged our players to not only be good players but to be good men in their communities. So we would love to partner with you.

Ms. JACKSON LEE. This would be not an existing program, but we are talking about a whole new approach.

Mr. SMITH. Absolutely.

Ms. JACKSON LEE. And so I look forward to that issue.

And this leads me to why I am here questioning today, because I want these young men to have completely vibrant lives into their middle ages and into their older ages.

I thank Jim Brown for staying in the room. And we acknowledge and thank you for sharing your great leadership. Thank you so very much.

Mr. BROWN. Thank you very much.

Ms. JACKSON LEE. My questioning is in his name, but also in the name of Earl Campbell, my champion, my Tyler Rose, among many others that have come out of the great colleges in Texas. And let me just continue to say, keep on coming.

But I do believe it is important—and my colleague made a very important point: We do not do this in anger. We do not do this in the need to undermine an organization that, frankly, there are many who will say you are America's pastime. The great interest of who bought the St. Louis Rams was not about trying to deny capitalism; it was to have you have the right image, the right attitude. That is why some of us expressed our opposition to who might be buying the Rams.

So I would simply say to you, these are my questions, Mr. Goodell in particular. How does a former NFL player qualify for the league's pension plan and disability benefit plan?

It is my understanding that a football player does not qualify for the pension plan until they have played for four seasons. However, the average span of a NFL career is 3.6 years. Considering these figures, it appears that the substantial amount of players are not eligible for the benefits that the league does offer.

Does the disability benefits plan operate under the same framework? So, is it not that they have to play 4 years, sir?

Mr. GOODELL. It is 3 years.

Ms. JACKSON LEE. They have to play 3 years.

And they only stay for about 3.6. So we can imagine—Mr. Smith, would you imagine that there could be injuries prior to 3 years?

Mr. SMITH. There are. There are people who do suffer those injuries. There are people who suffer significant injuries prior to their third year, second game.

Ms. JACKSON LEE. So, in actuality, this legislation, as we look at it, and the idea of the antitrust exemption which many of us are looking to consider as to whether or not that is a way of helping the NFL, are you suggesting that this kind of effort is very important to saving lives and saving future quality of life?

Mr. SMITH. I think anything that we can do to take a look at all of the information, to make reasoned decisions based upon that in-

formation so that we can aid more players who play this game, I think any step in that direction is positive.

Ms. JACKSON LEE. Ms. Culverhouse, could you just tell me again what you saw when NFL players had to fill out forms that had been so damaged? Could you just tell us again?

I, frankly, believe this is like the robust public option: sick people who need help.

Could you just give us that detail again, please?

Ms. CULVERHOUSE. Yes. You can imagine—I have suffered a concussion. I actually had a brain shear and could not access words for 2 years. Now, that was one concussion. You can imagine players who have sustained repeated concussions. They are now in their late 40's or 50's.

And you look at reams of paperwork. The print is so small, I have trouble with my glasses. They look at it, and they say, "Gay, I don't remember what year, what game, what date. I don't remember that." And then they look at all of it, and they say, "Is it worth it? What am I going to get? What am I going to get at the end of all of this?" And they would much rather go home, take a pain pill, and lay on the sofa.

It is daunting. And there are no advocates to help them fill this paperwork out. It is almost as though, if you have the intelligence to jump through those hoops, you are not disabled.

Ms. JACKSON LEE. Mr. Chairman, as I see the red light, let me just simply say this, Mr. Chairman. We are the help in this room. We are not the punishers, but we are the helpers.

And, frankly, if we do need this extra hammer, which sounds negative, sounds punitive, I believe these young men and I believe the NFL for what it has become to America warrants the involvement of this congressional body, warrants a review, whether it is legislation before us, whether it is a question of the antitrust issue.

Mr. Goodell, we are friends, but we must save lives. And these young people have so much to give America, that we must do that now.

Mr. Chairman, I count myself as part of a friend of this great sport. I am from Texas, and, boy, are we wedded to you. But we want our young people to be able to live in a good quality of life, come back after the NFL, and share their stories, fighting against youth violence. And I look forward to being in touch with both of your offices on this issue.

Mr. Chairman, you have been very kind. Thank you. I yield back to you.

Mr. CONYERS. Thank you.

The Chair recognizes the distinguished gentleman from California, Dan Lungren.

Mr. LUNGREN. Thank you very much, Mr. Chairman.

And let's not fool ourselves, football is controlled violence. That is the nature of the game.

You don't have to play in the NFL to get hurt. I have five knee surgeries, a new hip and everything, and I didn't even play varsity at Notre Dame, for goodness sakes. But the question is, is the violence controlled?

Teddy Roosevelt saved the game of football at the beginning of the last century, when things such as the flying wedge were al-

lowed and players died. And the question was whether they were going to outlaw this game in the United States. And Teddy Roosevelt brought the leaders of universities to Washington, D.C., without legislation and said, "Get your act together." So we don't always have to have legislation here. And I think this hearing does serve a very, very good purpose.

I would like to just concentrate on two things. One is education, and the other is on-the-field enforcement.

Players have a responsibility to be educated and to do the right thing. And we had a quarterback for the Redskins not too many years ago who head-butted a wall before a game and gave himself a concussion. We see players head-butting one another in celebration today. That is just nuts.

There is peer pressure that needs to be utilized, with information that the commissioner's office and the owners and the Players Association can give to—I mean, it is not macho to be head-butting one another before the game, for goodness sakes.

So, education is extremely important based on scientific information. I have no doubt about that.

But part of that is this: And in a briefing we had with the NFL a little bit earlier, a couple days ago, I asked, do you have any control over your commentators? And the answer I got was "no." But do you educate your commentators so that they don't make stupid statements about some of the plays on the field that will encourage that kind of conduct, maybe not by the players in the NFL, but by the kids watching?

So I would hope education would be an important part of whatever you do, both the players and the commissioner's office and the owners.

The other thing is on-the-field enforcement. We have had changes in rules. I am old enough to remember Jack Tatum. I am old enough to remember the cover story of Sports Illustrated where he was called "the assassin" and when he talked about trying to hit a player hard enough in the head that he hoped that he would drool as he was lying there on the field. And nobody really spoke out against that, in those days. That was considered, if not the norm, that was the bar that you wanted to achieve. And I know we have gone in a different direction since then, but we need to go even further.

Tim Tebow, probably the most famous college football player there is today, suffered a major concussion evidently—it sure looked like it—and he was playing the next week. I don't think that met Merrill Hoge's standard of 7 days. I wonder what the story is there. I know there were doctors that were involved, but.

And I attended a game at my alma mater just 2 weeks ago, and I saw a head hunter on the field that tore a helmet off a player, and he was left dazed. No penalty. The next week, that team played in the LA Coliseum; that same player did the same thing to a guy, I think, from it was either Oregon or Oregon State. No penalty. No penalty. He tore his helmet off. He is the second guy hitting him 2 weeks in a row. No penalty. And what the Pac 10 has just done is suspended the official for not calling a penalty. No penalty on the player.

Now, I realize that is college, not pro. But I would say, without talking about that particular instance, Mr. Martin, what message would that send to the team or to the players if, 2 weeks in a row—and I will take it away from that particular circumstance—but, 2 weeks in a row, a player did something which really went after a defenseless player and no call is made on that player 2 weeks in a row? What message does that deliver to the team and to the players?

Mr. MARTIN. Well, first of all, from my humble opinion—and thank you for the question, sir—I think it sends the wrong message, not only from the player himself, but also the coaching staff and the institution which they both represent. And I know that the safeguards, at least from a structured point of view in the NFL, those situations would not happen.

But I think that there has to be a point where the player, themselves, through education, I which I think is vitally important, has to realize it is incumbent upon him to conduct himself as part of that organization.

And that is why I am proudly old-school and proudly one of those that are from the yesterdays period of the NFL, because I have taken my responsibility of giving back to the community and my obligation to my teammates very seriously. And I think that is one of the reasons that I now head this post. And I would like to see more of that self-conscientiousness happen throughout all the sports.

Mr. LUNGREN. Mr. Goodell, I just have to say that, when that play has been shown, the ones that I referred to, the commentators almost always say, "And this person will be a first-round draft choice of the NFL because he is the kind of guy they are looking for."

I just want to tell you, I know it is not your responsibility, but that message seeps down to kids. And kids see that. And these are their heroes. And if that message gets out, that that is allowed on the playing field, frankly, you will have more assassins out there, and you will have more kids hurt.

And I don't think we can stand to allow that to occur with the knowledge we now have gained from the medical community, which we just didn't have before, just did not have before.

So I am taking in good faith what you have said, what Mr. Smith has said, what the doctors have said here. I mean, I truly hope you are taking this more seriously. Because the tragedy of the NFL players that have suffered dementia is a tragedy—or any player who has—but I am thinking about the kids coming up. And I hope that you folks are genuine in what you are telling us here today.

Mr. CONYERS. Thanks, Dan Lungren.

We have two Judiciary suspension bills on the floor right now, which requires that we declare a recess, lunch, et cetera. And we will resume after a series of votes as early as we can, which will be probably 45 minutes to an hour.

The Committee stands in recess.

[Recess.]

[2:20 p.m.]

Mr. CONYERS. The Committee will come to order. The Chair recognizes Bill Delahunt, the distinguished gentleman from Massachusetts, to continue in the discussion.

Mr. DELAHUNT. I had made some notes and now I am fumbling for them. This has been a very informative hearing. Do we have—I thought I saw Dr. Cantu. Is he still with us? I take it he has left. Well, maybe somebody on the panel can answer this question. It is a medical question, I presume. The term CTE, in what I have read, has—the information from the research done has come from—as a result of autopsies. Is there a technology now that exists that allows for the diagnosis or determination of CTE in a young male that is alive? I don't see anyone that knows the answer to the question.

Mr. GOODELL. I am not qualified.

Dr. TUCKER. Everybody is looking at me. I am not a neurosurgeon or a neuropathologist. So Dr. McKee, Dr. Maroon, Dr. Morgenlander will be able to answer that better. The quick answer from my perspective as a team physician is no. It is not—it is not easy or simple to make a diagnosis of CTE from an imaging study right now. Now, certainly there are MRI changes associated with dementia related diseases. But specifically to the question you ask, my answer would be no, but I would defer to the——

Mr. DELAHUNT. Right. I understand there is a second panel. But the purpose of the question I tell you what concerns me is obviously the league itself is the standard in terms of where young people—this hearing is not just about the NFL, by the way. It goes beyond that. I think there was testimony earlier, I forget from whom, that there are some 3 million participants in youth football today, presumably that excludes the universe of young men that are playing in college and even playing at the high school level.

So what we have at risk here aren't just players in the NFL, but thousands, hundreds of thousands of young males participating in football in this country, probably the most popular sport because of the popularity of the NFL. And I guess my question is, if there were to be a technology that could serve as—there was a diagnostic test to determine whether CTE was present in young people as they were playing the sport, it would serve as an early warning of a potential problem and inform those personnel who are coaches, who are athletic directors, that this young man should not be participating in a sport where there is the potential for a concussion.

And if that diagnostic tool does not exist, it might be incumbent on Congress working with the Administration to examine the feasibility providing funding through NIH or through some other appropriate relevant agency to do some real serious work to develop that so that we don't have young people out there playing when they shouldn't be playing and where I think as parents they could feel much more comfortable, because obviously the stories that have been related to the Committee by this panel are truly heartwrenching. And as a parent, and your testimony, Ms. Culverhouse, was very poignant in your concern and affection for your players, that I am sure you consider as part of your extended family.

Multiplying your feelings times literally thousands, tens of thousands or hundreds of thousands of, sets of parents really demands an answer about this issue. It is not just about the NFL. The NFL

is here today because this Committee has antitrust jurisdiction. But it is an issue that really I think, working together, needs to be responded to. But that was—that was my main question. And why don't I conclude with that and yield back.

Mr. CONYERS. This will be gone in further in the second panel. The distinguished gentleman from Iowa, the Ranking Member of immigration, Steve King.

Mr. KING. Thank you, Mr. Chairman. I want to thank the witnesses for your testimony today. And one of the things that came out of it for me was to be in the same room with George Martin and Willie Wood and Jim Brown. To see them all on the same field together, I didn't think I would ever actually see that. So I appreciate that. And I want to remind the folks here that just as I watched on Saturday night an Iowa-Michigan State game, there were two injuries that resulted in players being carried off the field and they were both helmet to helmet contact. So it comes in a particularly timely fashion. However, as I listen to the Members of this Committee discuss this and we have covered a lot of the territory, I note that Sheila Jackson Lee said that she is concerned that owners need the right image and her opposition to who might be buying the St. Louis Rams or her reason for that is owners that might not have the right image.

She wasn't any more specific than that, but we know who she is talking about, and that is Rush Limbaugh. But I would ask Commissioner Goodell this question: Your position on owners having the right image—and I would direct it to your statement on the 13th of October where you said I think it is divisive comments are not what the NFL is all about. I would not want to see those kinds of comments from people who are in responsible positions within the NFL, no, absolutely not. Now, I take you as a man of your word, but I would point out that you have a couple of owners that have performed lyrics in songs that are far more offensive. In fact, I don't think anything that Rush Limbaugh said was offensive. But with Fergie and with JLo, they have between the two of them alleged that the CIA are terrorists and liars. They promoted sexual abuse of women.

They have used the N word, verbal pornography, recreational drug use, et cetera and they are owners of the Dolphins. And it is also ironic that Fergie was approved as an owner on the very day that you made your statement against Rush Limbaugh. And I would point out for the Committee the statement that Rush Limbaugh made is this, that seems to be the one that survives the criticism. And that is, I think what we have had here is a little social concern in the NFL. The media has been very desirous that a Black quarterback do well. They are interested in Black coaches and Black quarterbacks doing well. McNabb got a lot of credit for the performance of the team that he really didn't deserve, closed quote. Now, I have scoured this quote to try to find something that can be implied as racism on the part of Rush Limbaugh and I cannot find it.

There is an implication of racism on the part of the media. That is the only quote that seems to survive the scrutiny of Chase checking back original sources in at least nine quotes that were alleged to Rush Limbaugh. And by the way, of those, eight are complete

fabrications, they are not based on anything, they are not a misquote, they are not a distortion. They are complete fabrication. And the one that remains stands true and shines the light against the media, not against Rush Limbaugh.

So if you are concerned about this, Mr. Goodell, then I would ask you are you prepared to level the same charges against Fergie and JLo or are you prepared to apologize to Rush Limbaugh today?

Mr. GOODELL. Let me try to take this in a couple of different directions. First off, my comments at the annual meeting were directed about specific comments he made about Donovan McNabb. And I made the point—and I will make it again here today—that the NFL is about bringing people together, it is about unity and that we do not move toward divisive actions. And, in fact, our teams, I think, have demonstrated that both on and off the field. Nothing brings a team and a community together better than the NFL.

Mr. KING. Mr. Goodell, were you considering those other quotes that I referenced when you made your statement or were you considering the one that was true, the one that I have read to you and the one that doesn't shine a negative light on Rush Limbaugh but on the media?

Mr. GOODELL. I am not shedding any kind of light on Rush Limbaugh here. I am not an expert on all of his quotes and I would try to reinforce something to you I said at the time. He was not even under active consideration as an NFL owner. This is—I stated this several times before, that we had not started a process to review ownership groups. They had not even determined to sell the St. Louis Rams. And it is something——

Mr. KING. You were speaking directly of Rush Limbaugh. You said the comments that Rush made specifically about Donovan I disagree with very strongly.

Mr. GOODELL. I do. Because I think Donovan McNabb is an outstanding young man. He is an outstanding quarterback and it has nothing to do with the color of his skin.

Mr. KING. I will just close with this. Here are Rush Limbaugh's—his position. And after 20 years on the radio, there is nothing there that would undermine this. He says my racial views? Do you mean my belief in a colorblind society where every individual is treated as a precious human being without regard to his race. And I will close with that, Mr. Goodell. And I would ask you to go back and take a look at the owners of the Dolphins and the language that is in the public venue, the songs that they have recorded, review those lyrics and I will provide some of those lyrics to you. And I will ask you to come back and respond to that question after the hearing as to whether you will put the same scrutiny on those owners who have really shined a negative light on the NFL as opposed to somebody that the NFL apparently just doesn't agree with his politics. I yield back.

Mr. CONYERS. The Chair now turns to the gentleman from New York, Mr. Weiner—oh. We will defer, we will hold our Member—our only Member whose athletic prowess was recently displayed just a few days ago. But I will now turn to Mr. Steve Cohen. Who is a Subcommittee Chairman and the gentleman from Memphis, Tennessee is recognized.

Mr. COHEN. Thank you, Mr. Chairman. And I thank the gentleman from New York. The game Monday night, that was here in the D.C. area, that, there was a running back for the Eagles, Brian Westbrook that was injured. He, as I understand it, had a grade 3 concussion, which is the max grade. The coach has reportedly said that he is "counting on Westbrook to be back on the field Sunday against the Giants." From what I hear, that doesn't necessarily sound like he is looking out for the most careful approach to Mr. Westbrook's concussion. Mr. Goodell, do you think that Coach Reid's comments were appropriate that "he is counting on him," which sounds like he is putting a burden on him to rise to the occasion of play after he has had a concussion just 6 days later?

Mr. GOODELL. As you say, I have not seen the quote, but I know Coach Reid. He has heard me repeatedly say these are medical decision, they must be made by medical professionals. My presumption would be that he has gotten medical advice of how he has responded to the injury and that he is continuing to be under very strict and very careful medical attention, and the doctors have given him the indication that he should be able to play.

Mr. COHEN. Let me ask you this, because Dr. Culverhouse made clear that the doctors are the teams' doctors. They are counting on him. They have got to get 3 yards. It is third and goal, and he is the guy. Well, when he is 60 years old, he might not have felt that it was good to be there on third and goal. Shouldn't there be some independent doctor that makes a decision when you are going to play, or possibly play, 6 days after a grade 3 concussion?

Mr. GOODELL. Well, I would offer to you that I believe our doctors did not work for the coaches. In many cases, in most cases do not actually work for the team. They work for other institutions, highly respected well, known medical institutions. They are doing this as part of their either representation of that institution. Or they are doing this because this is in addition to their other private practice.

Mr. COHEN. I am sure they do and they have got a Hippocratic oath, and all that stuff. But nevertheless, somebody signs the check and chooses among all those fine firms who they are going to pick. And still—just like Cesar's wife in the be beyond reproach, and also to be sure the player is being looked after, don't you think it would be nice to have an independent panel in these circumstances where there is a player looking to play within 6 days or 7 days or some limit?

Mr. GOODELL. I would say as long as it is made by medical professionals, I would support it.

Mr. COHEN. Medical professionals kind of, probably, okayed Muhammad Ali to fight Larry Holmes, which was a serious mistake. He did it for the money. There are medical professionals that send the boxer in the ring and send the football player on the field and they have—I just think you have to look after the players.

Dr. Culverhouse is to be commended. She obviously—I read about her last name on The Times on the Web. She has a great love for her players. Dr. Culverhouse, what do you think? Do you think a player like that should be sent into action with a doctor?

Ms. CULVERHOUSE. Absolutely not. Thank you. Absolutely, 100 percent not, no. There is no way. I have suffered a concussion, I

have watched my players suffer concussions, I have talked to my players about their concussions and there is no way that that player should be back on the field within 7 days of that kind of stage 3 hit, there is absolutely no way.

Mr. COHEN. Do you think there could be a system where there could be a 3-member group of physicians, or just some independent doctor, that could be created that the AMA would work with here, or some neuro——

Ms. CULVERHOUSE. Absolutely. That is what I had mentioned earlier. I think that if you have an independent neurologist and you only really need one per game because they would work for both teams as independent evaluator. But these players—we grew up with Marcus Welby. We trusted our doctors. Even when they said something, we didn't want to hear, we trusted Dr. Welby. These players go into the NFL and they trust their college doc, they trust their team doc. And then all of a sudden, their team doc is shooting them up in the locker room before they go out to play so that they can make the score, so that they can block. And then at half-time they are putting cuffs around their arm to IV them for the fluid loss. Cuffs are not best medical practice for IV'ing a player. The player is not being looked after by Dr. Marcus Welby. He is being looked after by a coach's ally whose goal is to get the player back on the field and make that score.

Mr. COHEN. Barbaro has better independent advisor, did.

Ms. CULVERHOUSE. Yeah, I liked that horse.

Mr. COHEN. Yeah, I did too. And there was—okay, Mr. Chairman, if I could ask one last question. Doctor, where are the other owners? Are there other owners that have the same feelings that you about their players, and have spoken out on these issues?

Ms. CULVERHOUSE. Not to my knowledge. I am a rebel with a cause. Not to my knowledge. You have to understand also that Mr. Goodell works alternate the pleasure of the owners, so actually he is representing here every owner in the NFL because if he was not saying what they wanted him to say, he would be replaced.

Mr. COHEN. Thank you, Mr. Chairman.

Mr. CONYERS. The Chair is pleased to recognize Judge Louie Gohmert of Texas.

Mr. GOHMERT. Thank you, Mr. Chairman. And I do appreciate all the witnesses being here, your patience with us particularly. And, Mr. Smith, congratulations on being executive director of the NFL players. I know something about your background. And I understood one of the benefits that was deemed to have someone with your prestige from Patton Boggs that does some lobbying, was the contacts that you had had with Congress. Was there something in mind that you had and have that Congress might do to help the NFL?

Mr. SMITH. The NFL players?

Mr. GOHMERT. The NFL player—you don't want to help the NFL, you just want to help the players? Because I took it you would want to help the whole NFL?

Mr. SMITH. I think it is right to look at both the NFL and the players. I think that holding this hearing today is both in this instance and historically one of this great body's major roles, to shine not only the light that comes from asking tough questions of people

who are brought before this Committee, but also serving in your role to bring it—to bring it out to the public in general. So I think when Congress asks tough questions, when we are asked to come forward and present information, I think that is a good thing for the National Football League. I know it is a good thing for the players of the National Football League.

Mr. GOHMERT. When I say NFL as an outsider, I always think of the players, everybody, owners, managers, coaches, all of that within the NFL. That is what somebody like me sees when we see the NFL. So it is nice when you work better together than Congress does. But, Dr. Culverhouse, I really appreciate your compassion for the players and all. I am curious, do you see Congress needing to do something to step in and start telling owners and players in the NFL what they need to do?

Ms. CULVERHOUSE. Absolutely. You are the only body that can tell the NFL what to do.

Mr. GOHMERT. I see. Well—okay. What if we decide we don't want you as an owner anymore? I mean that kind of thing.

Ms. CULVERHOUSE. Fine with me. Get somebody honest, straightforward, who cares about the players in there instead.

Mr. GOHMERT. What we find here in Washington is that it just seems to depend on who is in office. Currently we know for example, from the insurance industry that when the White House or leaders in Congress get upset with an industry and threaten them and say we may yank your antitrust exemption, that they are willing to retaliate and do something like that. So there is a message there. Some of us think it is important to make sure that everybody plays fair and there is a level playing field and then make sure that in the case of the NFL you have got the players and the owners who have a level playing field on which to meet and work things out for the benefit of the entire NFL. But when Congress steps in, it seems like invariably we don't make things better, we create more problems.

Look at our track record. And in fact—in view of the way things have gone here lately, it seems like perhaps the solution that some here in Congress might come up with to fix the NFL would to be give people more choices, give them a Federal-public option. We know Green Bay has a city option, but give them a public option where we start having government teams because I think if we truly had some government run teams, that perhaps Tampa Bay, St. Louis, Tennessee would not be undefeated. They would have some wins under their belt if we had some government teams right now. So they would have somebody they could beat up on. But that is my concern. And Mr. Goodell. That is my concern. So often when we come in and weigh in to an issue, sometimes we muck it up even worse.

Ms. CULVERHOUSE. You know, I have more trust in you than that.

Mr. GOHMERT. You haven't been in Congress obviously.

Ms. CULVERHOUSE. Hope springs eternal in my world.

Mr. GOHMERT. It springs eternal in mine and that is why I am still here. But I still think the role of government is not to be a player, but to be a referee and make sure that everybody is playing fairly and that is the only time that we should step in, but if we

get too involved in the intricacies of any industry—ask the car dealers. Good grief. So I have just dealt with so many people that said if I had known what you were going to do with our knee by the time it got to the floor and got voted on, I would never have asked Congress to do anything. So please keep that in mind when you ask for anything, it may come out as something you never dreamed that makes things worse. But I appreciate all of your patience. I appreciate the pleasure that you have brought to so many. We do want to make sure that people stay as healthy as possible in such a tough game. Thank you very much.

Mr. CONYERS. Thank you, Judge Gohmert. The Chair recognizes Linda Sánchez of California——

Ms. SÁNCHEZ. I believe Mr. Weiner is ahead of me in line.

Mr. CONYERS. Two interceptions, plenty of respect. What are you talking about? I am very delighted to recognize the starring player representing the Congress, Mr. Weiner from New York.

Mr. WEINER. Thank you, Mr. Chairman. I want to recognize someone who lived up to his storied family name, Tom Rooney from Florida, who played a remarkable job at tight end and, from time to time, did that thankless of all jobs, offensive line, who did a great job in the game as well. I want to thank you, Mr. Chairman and Ms. Sánchez. I just want to establish for the record, Commissioner, who is Dr. Irv Casson?

Mr. GOODELL. I believe you mean Ira Casson?

Mr. WEINER. Do I mean Ira? Ira Casson.

Mr. GOODELL. Yes. He is a doctor that serves on our MTBI committee as co-chair.

Mr. WEINER. Isn't it a fact that the Committee asked for his presence here today and he is an employee of yours, is that fair to say? Do you sign some element of his paycheck?

Mr. GOODELL. He is not an employee of the NFL.

Mr. WEINER. Does he represent you?

Mr. GOODELL. He represents the MTBI committee as co-chair.

Mr. WEINER. We asked him to participate in this hearing. He was unavailable and we asked for your help in having him appear here. Can you just clarify the record, did you ask him to be here and he said no?

Mr. GOODELL. I did not get involved in that, no.

Mr. WEINER. If you could, while I am asking my question, members of your staff can find that out. I also—I think the record should show beyond any work of any Member of Congress, even you, Mr. Chairman, you, Ms. Sánchez, Alan Schwarz of The Times has been driving this issue with some of the reporting and we probably wouldn't even be here today if it were not for some of the stories that he has written both at the college level and the pro level about this problem. In a recent expose that he published, frankly went into the questions of credibility about the study that the league is currently undertaking.

And basically three points of contention emerge from his reporting. And the first is the notion that any of the NFL supported and funded research would lack a basic level of independence. That some of the statements that have been made on behalf of the NFL put a cloud over whatever research might show.

A second concern that was raised by experts not associated with this debate but associated with just research is the relative paucity of subjects that are being studied for the purpose of trying to clear some of the dust around this issue and get down to the brass tacks which is what every Member of the Committee has testified what they would like to do.

And third has been the role of this Dr. Casson who has taken some rather high profile positions, pooh-poohing some of the research that has been done and basically driving a fairly hard line that in fact the saying, going as far as to say, to question and being a little dismissive of the notion that multiple concussions actually do lead to problems later on in life. Wouldn't it be, for the purpose of this conversation, getting back onto a more even keel where is not seen. We had a member of the NFL staff refer to the research that had come—that reinforced dementia links as phantom. Bad use of language. I think everyone would agree that shouldn't have been language that was used.

But let me give you the context of that quote to give you a sense of why I think this debate is not going in the right direction. "I say phantom says this"—says Joe Brown, NFL spokesman, "because we have not seen this analysis in our office. If it was done, it was obviously written for the NFL players union on self-promotional lobbying purposes in anticipation of next week's congressional hearing." That is this one. Putting aside that lines have been drawn here, for the purpose of really allowing the public to have confidence in the end product and given that this has been characterized as a political issue between the players and the league and given that there are experts who can give sound advice on this, wouldn't it be perhaps most wise to put the breaks on the study that is going on, the ADA plan that has raised so many questions about its impartiality, whether it has enough subject, whether or not the people supervising it have not already formed opinions, and say let us try to error on the side of absolute impartiality by saying, let us try to find somebody separate and apart from this whole debate, but someone who is good at this kind of stuff, that both sides of the debate at this table and all sides of the debate in public can take a look at that information and say we have absolute confidence in because for those of us for whom this—this is a worker safety issue for a lot of us.

I mean, putting aside whether or not we like your product, and I do, this is a worker safety thing, no different than if someone was coming off the assembly line at a production plant and 20 years later they all had—they all had arthritis in their right knee. We would look at it the exact same way, I would think.

So if you can give me the answer to that question, about why it might not just be better for your own purposes to say let's take this out of the existing structure, where so many questions have been raised about it, and do something truly independent, stop this where it is, something truly independent, something that the league, Congress, everyone agrees is independent, and start from scratch to try to get this right?

Mr. GOODELL. Well, the answer to your question is that we want you to have confidence in the studies. That is one of the reasons, for the 15 years that we have been involved in this issue, we have

published every piece of data that we have ever done. We have published it publicly, we have given it to medical journals, and it is part of peer review.

So I think when you talk about Dr. Casson and others, we don't control those doctors. They are medical professionals, they are scientists, they do this for a living. They look at these issues independently. They draw conclusions. We have obviously debates——

Mr. WEINER. Let me stop you. Are you confident of that today as we sit here, that Dr. Casson is an independent viewer of this, given some of the statements he has made? I mean, do you believe that?

Mr. GOODELL. Independent of what? Independent of my views?

Mr. WEINER. No, independent of a position here. It seems to me that he arrives at this debate with certain notions. I mean look, the NFL has said research has not shown any connection to long-term problems in NFL players. I mean obviously that is—I mean today I doubt you would say that multiple concussions don't create long-term problems today knowing what you do now. The question is the confidence in this report has been seriously undermined.

I mean, you read Mr. Schwarz's reporting. He went around and called academics and physicians, and they asked him a couple of questions, and they said in these important areas already today before a single bit of—I shouldn't say that—at this early stage of the research there are already so many questions, why continue going down this path? Why not try to address the structural problems in the research, you know, that we don't have the classic garbage in, garbage out. I mean not to be too harsh and not to question anyone. Just the appearance is clearly that this research is stacked and is lacking in credibility. And it is also clear that the parties involved have developed—I mean I think you would agree with this—have developed a sense of loggerheads about this issue that I don't think serve most of the public. I mean most members of the public are not partisans for the players or for the union. We basically want to try to get this policy right and try to make sure that people are protected. So wouldn't it be better to start, get a fresh start with a fresh report?

Mr. GOODELL. Well, we want Congress, we want the medical community, we want everyone involved to have confidence in the work that is being done, and that is why we have medical professionals involved. That is why we put it up for peer review and why they choose that. If this Committee believes there are ways in which we can improve that by making it more independent in some fashion, I would be happy to work with the Committee to do that. We want you to have confidence in the work that we are doing.

We have led the way. Many people have taken our research and used it, including, it was mentioned earlier this morning, the Department of Defense. We have met with them and shared our research.

Mr. WEINER. Well, I appreciate your willingness to assess this as we go along. And did you find out an answer to the question whether a member of your staff made any effort to secure Dr. Casson for this Committee?

Mr. GOODELL. I am just reading this to you as I get it. Our office was not asked to help get Dr. Casson to testify.

Mr. WEINER. Thank you.

Mr. CONYERS. Thank you very much. I am pleased to recognize Judge Ted Poe of Texas.

Mr. POE. Thank you, Mr. Chairman. I want to thank all of you all for being here all day and your testimony. As the Chairman mentioned, I am from Texas. And when you talk about football, we believe we are the best, you know. And I have two favorite college teams, University of Texas and anybody that plays Oklahoma. My brother-in-law played for the New York Giants for 5 years. Everybody plays football, wants to, I think. My son started at 9 years of age and went all the way through college, played college ball, never missed a football game.

So football, as all of you all know, is something that we do. And this report and your testimony about this report is I think important for us to be aware of injuries that can occur. But I am really not clear as to what Congress ought to be doing involved in professional football. I mean if Congress gets involved, it would seem to me it would be the end of football as we know it. We would all be playing touch football out there on these football fields, whether it is pros or college or high school or peewee league.

People know when you play football there is a chance that you are going to get hurt. Parents know that, players know that, and all of you all know it better than anybody.

My question really is what do you want Congress to do about the information that all of you all have testified about and the report? What is it you want us to do?

Commissioner, I will start with you on this end if you don't mind.

Mr. GOODELL. Congressman, as I stated in my opening remarks, we are not waiting to see where the medical research goes. We are taking steps now to improve our game, prevent injuries, make sure when injuries do occur that they are treated properly, conservatively, and safely, and that we are caring for our athletes. We have to do a better job of that. We must continue to push this research.

I think the exposure and the issue that is raising this is a public issue, a public health issue. And the debate that goes on within the medical community is healthy because it does put on a spotlight to something that can affect millions of people. Alzheimer's itself is projected to be affecting over a hundred million people in the very foreseeable future on a global basis.

This is a significant issue. So we want to be part of the solution. We want to be able to share our data, share our information, and continue to make progress in this area that will affect thousands of people that are not playing football, that are playing other sports, or may not even be involved with sports. So if our data can be helpful to that, we would like to be part of that.

Mr. POE. Well, I understand what you have said. And the research has been passed on to not only other sports, but to health professionals as well, the research that has been done. But that doesn't really answer my question. What do you want Congress to do? Do you want more research funds from Congress to the private sector?

Mr. GOODELL. No, with all due respect, I was asked to come here. So I am not asking Congress to do anything.

Mr. POE. Well, that might be a first. But let's just go on down the row if we have got time. Mr. Smith, thank you.

Mr. SMITH. Yes, sir. I think two things. One, I think Congress should ensure or seek to ensure that there is the disclosure of the aggregate medical data that is being collected on NFL players. I think that is one. And number two, to take up your point earlier, I think it is Congress's role to make sure that the business playing field or the other playing fields that businesses engage in is fair, is equal.

So when Congress assures itself that it has done everything it can do in order to protect the safety of the people who play this game on the professional level, on the college level, on the youth level, I think that is Congress serving its role.

Mr. POE. All right. Thank you. I am about out of time. I will just let anybody else weigh in on the last minute that I have. Anybody else want to weigh in on that?

Ms. CULVERHOUSE. I would like you to help me keep my grandson from being damaged.

Mr. POE. And how would you expect Congress to do that?

Ms. CULVERHOUSE. I think Congress is very creative. I believe in Congress. I believe in the United States. Don't get me started on that. But I believe you have power that others of us don't, and that is why we elect you to this office.

As a constituent with six grandchildren, I am asking you to please help the youth of our day now and the future football players of tomorrow to stay safe. Call it an OSHA deal, call it anything you want, but they go from being our youth in America to our employees. And we have, I believe, as Americans an obligation to make this a safer sport.

Mr. POE. I appreciate that.

Last comment. Mr. Chairman, as I mentioned, you are not the only person with grandchildren. I have got seven and a half and four kids, and I think it is a parent's role to at the very early age to take care of the safety of their children. I certainly don't think the Federal Government has a role to intervene in that. But Congress may have a role in making sure that there may be some funds for research and development. But getting involved in the everyday operation of an NFL football team, Congress is not qualified to do that. Maybe we should stick to what we know best.

With that, thank you, Mr. Chairman. I will yield back the remaining portion of my time.

Mr. WEINER. What is that? What do we do best?

Mr. POE. We discuss things, debate.

Mr. CONYERS. The Chair is pleased now to recognize our former Subcommittee Chair, Linda Sánchez of California.

Ms. SÁNCHEZ. Thank you, Mr. Chairman. I want to start by making a comment first on some of the testimony before I move on to the questions that I have. And I want to start with something that Mr. Goodell said.

You were quick to mention some improvements that the league has made in the last 2 years to try to minimize some of the red tape and some of the hurdles for NFL retirees who are applying for disability benefits, and I just wanted to point out to the skeptics on this dais that the changes that the league made were very much

in keeping with some of the suggestions that came out of the Subcommittee's hearing on this very issue in June of 2007, which is about 2 years ago. So for those of you that think that Congress is ineffective, I think the congressional scrutiny might have had a little something to do with some of those positive changes.

Now before I get to my questioning, I want to first show a brief clip that is courtesy of HBO's Real Sports.

[Video shown.]

Ms. SÁNCHEZ. Okay. And Mr. Goodell, you are about to be handed a copy of a pamphlet that I believe is currently distributed to NFL players. And I would ask you to please read the highlighted portion of the pamphlet. And if I may ask unanimous consent to also enter it into the record, Mr. Chairman.

Mr. CONYERS. Certainly. Without objection it will be.

[The information referred to follows:]

How do I know if I have had a concussion?

These are some of the symptoms you may experience immediately or within a few days of having a concussion. Every concussion is different, players may react differently and not all players will experience the same symptoms.

The most common symptoms are:

Imbalance: You may feel a change in your sense of balance, feel dizzy, or unsteady on your feet.

Headache: This is the most common symptom with concussion. It may be mild to severe in intensity and you may feel like there is pressure in your head. This may be accompanied by nausea and vomiting.

Confusion: You may be confused about where you are, about a play, the score or game situation. You may not remember the play you are running.

Memory loss: You may lose memory about things that happened BEFORE or AFTER you were hit. You may not remember what happened during the play or the quarter before your collision. Or you can't remember what happened on the field or on the sidelines after your hit. You may ask the same questions over and over again.

Loss of consciousness: You may black out or get knocked out, even for a second or two.

Vision change: You may become sensitive to light, have blurred vision, double vision or feel like lights seem brighter. Some athletes also report "seeing stars" or other objects following a hard hit.

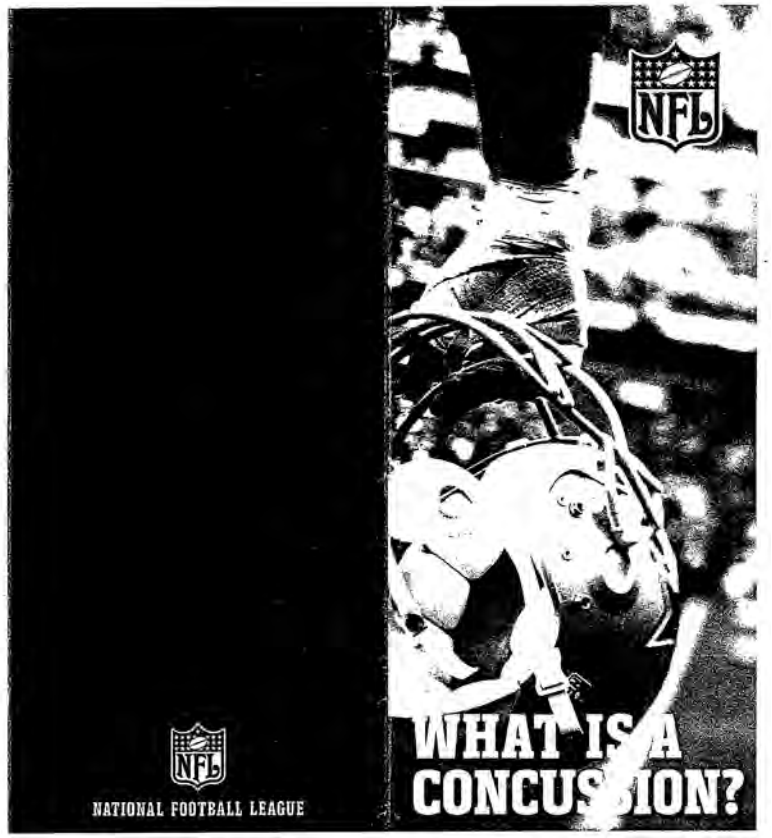
Hearing change: You may feel a change in your hearing so sounds suddenly seem very loud, or you may hear a high pitch tone in your ears.

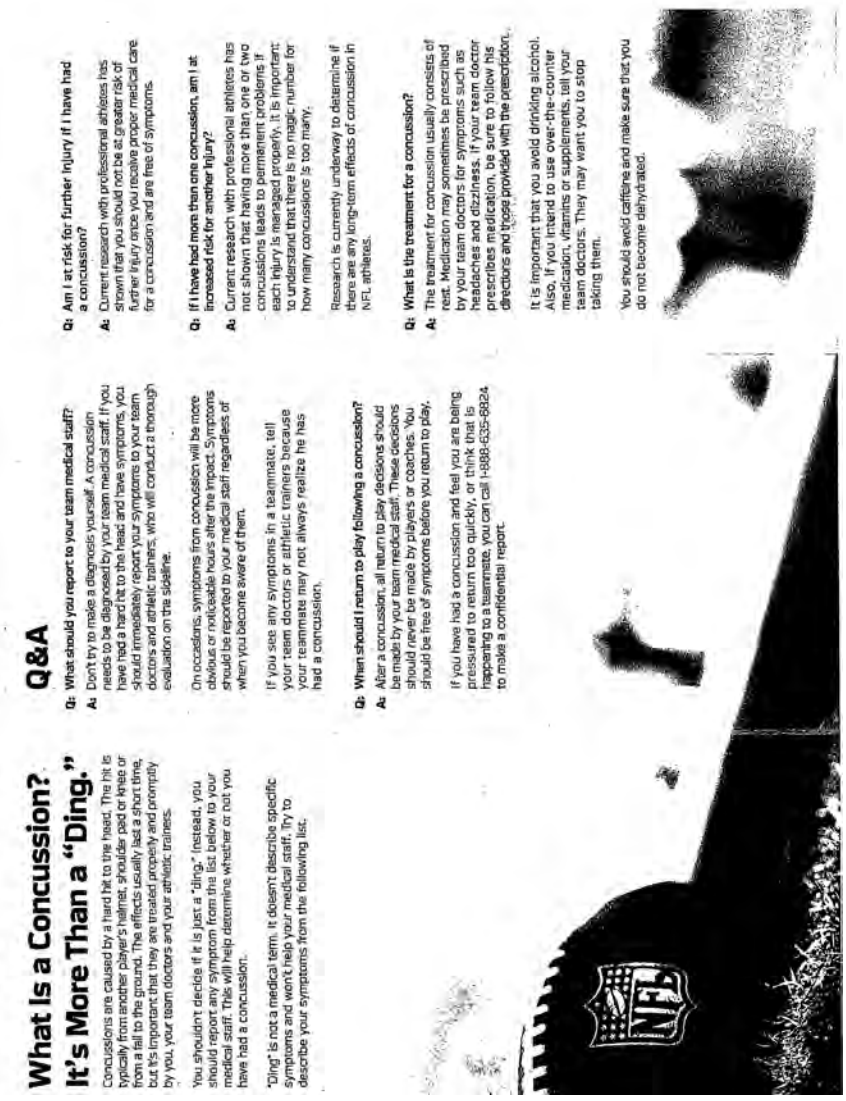
Mood change: You may have a sudden change in your mood or a teammate may notice a change in your mood following a collision. For example, you might suddenly start to laugh or cry for no reason. You may not know this is happening but teammates, coaches, or the medical staff may see it. After a game, you may feel more irritable, anxious, or cranky than usual.

Fatigue: You may feel more exhausted than usual after a game when you had a hard hit to the head. Some athletes report that they need to sleep many more hours after a concussion.

Malaise: You may just "not feel right" but can't point to a specific problem. Not every hard hit to the head leads to a concussion and whether or not you have a concussion can only be determined by your team doctors and athletic trainers. If the team medical staff does not know that you are injured, it can't help you!

You may not always recognize your symptoms. But your teammates, coaches or family members may see a difference in you that you don't. If someone sees a change in you, take it seriously and report it to your team medical staff.





What Is a Concussion? It's More Than a "Ding."

Concussions are caused by a hard hit to the head. The hit is typically from another player's helmet, shoulder pad or knee or from a fall to the ground. The effects usually last a short time, but it's important that they are treated properly and promptly by you, your team doctors and your athletic trainers.

You shouldn't decide if it is just a "ding." Instead, you should report any symptom from the list below to your medical staff. This will help determine whether or not you have had a concussion.

"Ding" is not a medical term. It doesn't describe specific symptoms and won't help your medical staff. Try to describe your symptoms from the following list.

Q&A

Q: What should you report to your team medical staff?

A: Don't try to make a diagnosis yourself. A concussion needs to be diagnosed by your team medical staff. If you have had a hard hit to the head and have symptoms, you should immediately report your symptoms to your team doctors and athletic trainers, who will conduct a thorough evaluation on the sideline.

On occasions, symptoms from concussion will be more obvious or noticeable hours after the impact. Symptoms should be reported to your medical staff regardless of when you become aware of them.

If you see any symptoms in a teammate, tell your team doctors or athletic trainers because your teammate may not always realize he has had a concussion.

Q: When should I return to play following a concussion?

A: After a concussion, all return to play decisions should be made by your team medical staff. These decisions should never be made by players or coaches. You should be free of symptoms before you return to play.

If you have had a concussion and feel you are being pressured to return too quickly, or think that is happening to a teammate, you can call 1-888-635-6824 to make a confidential report.

Q: Am I at risk for further injury if I have had a concussion?

A: Current research with professional athletes has shown that you should not be at greater risk of further injury once you receive proper medical care for a concussion and are free of symptoms.

Q: If I have had more than one concussion, am I at increased risk for another injury?

A: Current research with professional athletes has not shown that having more than one or two concussions leads to permanent problems if each injury is managed properly. It is important to understand that there is no magic number for how many concussions is too many.

Research is currently underway to determine if there are any long-term effects of concussion in NFL athletes.

Q: What is the treatment for a concussion?

A: The treatment for concussion usually consists of rest. Medication may sometimes be prescribed by your team doctors for symptoms such as headaches and dizziness. If your team doctor prescribes medication, be sure to follow his directions and those provided with the prescription.

It is important that you avoid drinking alcohol. Also, if you intend to use over-the-counter medication, vitamins or supplements, tell your team doctors. They may want you to stop taking them.

You should avoid caffeine and make sure that you do not become dehydrated.

Ms. SÁNCHEZ. Mr. Goodell?

Mr. GOODELL. Yes, I read it.

Ms. SÁNCHEZ. Yes, please. Where it starts, "If I have had more than one concussion"——

Mr. GOODELL. Yes.

Ms. SÁNCHEZ. Can you read that out loud, please?

Mr. GOODELL. Oh, I am sorry. "Current research with professional athletes"——

Ms. SÁNCHEZ. Pardon me, can you back up and read the question and then the answer that is in the pamphlet?

Mr. GOODELL. "If I have had more than one concussion, am I at increased risks for another injury? Answer: Current research with professional athletes has not shown that having more than one or two concussions leads to permanent problems if each injury is managed properly. It is important to understand that there is no magic number for how many concussions is too many."

Ms. SÁNCHEZ. Okay. Thank you. Now, the question that I have for you is, I am a little concerned, and I hear the concern expressed by some of the witnesses on the panel today, that the NFL sort of has this kind of blanket denial or minimizing of the fact that there may be this, you know, link. And it sort of reminds me of the tobacco companies pre-1990's when they kept saying no, there is no link between smoking and damage to your health or ill health effects. And they were forced to admit that that was incorrect through a spate of litigation in the 1990's. And my question to you is wouldn't the league be better off legally, and wouldn't high school and college football players be better off, if instead of trying to minimize this issue, the league took the opposite perspective and said, look, even if there is a risk, however minuscule, that there may be this link, so we really need to jump on top of it and make kids and parents aware of this so that there isn't this sort of sense that the NFL is really just slow walking the issue to death by saying, well, we have been studying the issue for 15 years, we are going to maybe study it another 15 more years, when there is already non-NFL paid for research that suggests that there is this very high correlation with cognitive impairment? Don't you think the league, you know, would be better off legally, and that our youth might be a little bit better off in terms of knowledge, if you guys just embraced that there is research that suggests this and admitted to it?

Mr. GOODELL. Well, Congresswoman, I do believe that we have embraced the research, the medical study of this issue. As you point out——

Ms. SÁNCHEZ. You are talking about one study, and that is the NFL's study. You are not talking about the independent studies that have been conducted by other researchers. Am I correct in stating that?

Mr. GOODELL. I am not sure of your question.

Ms. SÁNCHEZ. There are other studies, research in dementia and CTE that show that there is a link. But again the league seems to downplay that and say, well, you know, we are conducting our own study and, you know, when we have that study completed then we will know.

Mr. GOODELL. No, I think what we are doing is because we have to a large extent driven this issue by making sure that we have medical professionals studying this issue. I am not a medical professional.

Ms. SÁNCHEZ. I understand that. And I understand that Dr. Ira Casson is, who unfortunately is not here to testify today, because there are a number of really great questions I would have loved to have asked him. And I would think that, as the person who is spearheading the research and the one who is individually examining the players who will participate in the study, I think it would have been really important for him to be here today. And I hope

that in the future—maybe you didn't get asked to have him here today—but I think in the future it would be really appreciated by the Congress if you could ask him to come so that we could put specific medical questions to him. Because you know, without him here I am not going to get medical answers out of you, and that is very clear to me.

But I just want to briefly go through one of the big issues with respect to the research that is currently underway by the NFL. There are other professionals who have looked at the methodology. And some of the concerns have been already raised, but I just want to kind of go through them again. One of the criticisms of the study is that the statistical comparison is going to be between professional football players and people who played football in college. That is sort of like comparing two-pack-a-day smokers with one-pack-a-day smokers to see what the differences are, instead of two-pack-a-day smokers with the general population to see whether there is an increased risk of the activity that they are participating in to their health. So that has been an issue that I think merits your going back and talking to the doctors who are conducting this study about trying to tweak in the study.

The second thing that really troubles me is that the subjects are sort of self-selected. You sent out phone calls and letters and asked for people to participate. Well, homeless people don't typically have addresses where you can send letters. And people with cognitive impairment, some of the effects of which are slurred speech, trouble focusing, memory loss, physical incapacity, they are going to be unlikely to really respond to a phone call or to a letter or to physically, many of the worst cases, be able to travel to New York to be examined by Dr. Casson. So I think you guys need to go back and rethink how you are selecting the participants in this so-called unbiased study.

And third, and this is probably the most troubling, as was exhibited by the clip, it appears that Dr. Casson, who is the only one again who is going to be examining these former players, has already made up a determination of what the conclusion of the study is going to be.

So my question is why are you even going through, you know, the charade of presenting the final analysis of going through this study if the determination, in my opinion, has already been made by Dr. Casson and, you know, is denied in the pamphlet that they hand out to NFL players?

Mr. GOODELL. Well, first let me say I do not, and I think you stated that he is the only one examining these patients and the findings. That is not correct.

Ms. SÁNCHEZ. He is not controlling the examinations or the findings?

Mr. GOODELL. I would not say he is controlling that at all, no.

Ms. SÁNCHEZ. He is participating in it, though.

Mr. GOODELL. I do not know if he is participating in the examinations. I can find that out.

Ms. SÁNCHEZ. And he has been a consultant to the NFL, is that correct?

Mr. GOODELL. He has been on our MTBI committee for several years, yes.

Ms. SÁNCHEZ. And some of the people who are participating in this study have other conflicts of interest. You know, one of the committee members on the concussion committee owns the company that makes and markets, mainly through its use by most of the NFL teams, the neuropsychological test that is used in the study. Isn't that true?

Mr. GOODELL. I don't know the answer to that question, but I will find out for you.

Ms. SÁNCHEZ. Okay. I am just concerned because there are several people that are part of this study that are NFL-related, either being paid by the NFL as consultants or actual employees of the payroll.

Mr. GOODELL. Well, Congresswoman, I go back to something that I stated early on in my opening remarks. We had a medical conference in 2007. And you are correct to your point about the last hearing we had here was very helpful. And I will submit for the record about 20 changes that we made that are significant to our player benefits. And I will submit that. And so we do acknowledge that and we appreciate that. But I have also been Commissioner for 3 years. So I want to make sure that that is clear. You are also raising a very important point. I don't control the doctors' output. The doctors that we have involved with this, I do not judge whether they have a particular view going in or going out. This is a collective group that are tremendous professionals, that have studied this and other issues on a scientific basis, and this is part of medical debate. And I think it is clear today there is a significant medical debate about the impact, what that impact is, and at what point. As I say, we are trying to move past the medical debate on one level, which is control, what we can control and try to bring solutions.

Ms. SÁNCHEZ. My suggestion would be, and my time has expired, but my suggestion would be that instead of having NFL-connected consultants and doctors, that perhaps the true findings of a truly unbiased study would be better conducted by people who have not been on the payroll or not been retained by the NFL in any capacity.

And with that, I will thank the Chairman for his patience and yield back.

Mr. CONYERS. Thank you very much. Tom Rooney, of recent amateur football fame, is now recognized, the gentleman from Florida.

Mr. ROONEY. Thank you, Mr. Chairman. And I want to thank Representative Weiner for recognizing the people on the line of scrimmage who are allowing you to be heroic in getting the defensive game ball. I am going to recuse myself from asking questions specifically of the panel, though I do want to thank you all for being here and for your testimony today.

I, like the Commissioner, played college football at Washington & Jefferson, and also on the other side of the table, although I see that he is gone now, I was roommates with Merrill Hoge for a year or so. I certainly empathize with both sides of this debate, although like some of my colleagues, I am not really sure what our role in Congress should be in getting involved with the National Football League.

You know, football is a very violent game. And certainly as one who played it and suffered concussions myself, I can say that those that choose to play football, those that involve themselves with the sport fully understand that.

I will take the liberty, briefly, to say and to question the statement that was made earlier that pro football teams don't care about their players beyond scoring touchdowns. I hope that is not true. I hope that that isn't what was meant. And in fact I know that is not true. Beyond this hearing, but at least this hearing, I would say, Mr. Chairman, raises the serious issues of safety and head injuries, and that is a good thing. And I am confident that the NFL and the players union will continue to work together to make sure that they are doing everything that they can to improve the league and improve player safety for years to come.

I yield back. Thank you, Mr. Chairman.

Mr. CONYERS. Thank you very much, Mr. Rooney. And I thank the witnesses.

Commissioner Goodell, in response to a question from the gentleman from New York, Mr. Weiner, you indicated that the Committee never requested that Dr. Ira Casson testify. I understand that you would like to clarify that response.

Mr. GOODELL. I was handed a note to respond to the Congressman. And I have just been handed another note which I will read to you as I see it: "Tell them you will check further to get back to them in writing tomorrow. So I have not been contacted."

Mr. CONYERS. Okay. This record will be open for a while afterwards, so you can submit any——

Mr. GOODELL. I will check with our staff further.

Mr. CONYERS. Well, I want to thank this panel. This has been surprisingly well-attended. The views are various. But I think there are some things that we can come to an agreement on about the serious nature of these injuries and the fact that there is still more that can be done about them. And for that reason, I am in your debt.

I am sorry that we took so long to complete this first panel. I thank you very much, and you are now excused, or invited to stay and hear the second panel. Thank you very much.

Now, our final panel is Bernie Parrish; Dr. Joel Morgenlander, neurology at Duke University; Dr. Julian Bailes, Chairman, Department of Neurosurgery, West Virginia School of Medicine; Dr. Joseph Maroon, Vice Chair, Department of Neurosurgery, University of Pittsburgh; Dr. Ann McKee, Associate Professor, Neurology and Pathology, Boston University; Mr. Christopher Nowinski, Co-Director, Center for the Study of Traumatic Encephalopathy; Dr. Eleanor Perfetto, wife of Ralph Wenzel, former NFL player; Dick Benson, high school football safety advocate. And we will be starting off with—and Mr. Tiki Barber, retired NFL player.

Because of time constraints involving Dr. Perfetto, we are going to invite her to testify first. She is the wife of the former San Diego Chargers lineman Ralph Wenzel, and currently serves as the Senior Director in the Pfizer Evidence-Based Strategies Group. She is the caregiver for her husband, who has early onset Alzheimer's, and has been awarded the Advocacy Leadership Award by the New York City chapter of the Alzheimer's Association. Welcome to our

second panel. And I am delighted, Dr. Perfetto, for you to begin our discussion.

TESTIMONY OF ELEANOR M. PERFETTO, Ph.D., M.S., WIFE OF RALPH WENZEL, FORMER NFL PLAYER

Ms. PERFETTO. Thank you, Mr. Chairman. Chairman Conyers and Committee Members, thank you for inviting me to speak today. My name is Dr. Eleanor Perfetto, and I am a pharmacist with a——

Mr. CONYERS. Pardon me, pull the mike up closer.

Ms. PERFETTO. I am a pharmacist with a Ph.D. Degree in public health, concentrating in health policy and epidemiology, and I am employed by Pfizer. I tell you that because I wear two hats today, predominantly as a wife and caregiver, but also one as a health researcher.

The topic of this hearing is very important to me, and it has been for almost 15 years. I want to tell you about my personal experience and provide suggestions about urgent actions that need to be taken by the NFL to help disabled retired players, current players, and children involved in sports today.

My husband, Ralph Wenzel, played as an offensive guard in the NFL for 7 seasons, retiring in 1974. In 1995, over 20 years after retiring from the NFL, my husband began having vague disconnected symptoms, depression, uneasiness, anxiety, losing things. Today we recognize those symptoms as resulting from CTE. In the years following Ralph suffered obvious memory loss and confusion. And in the fall of 1999, 10 years ago, at the age of 56, Ralph was diagnosed with mild cognitive impairment, which progressed to severe dementia. In the last 10 years, Ralph has lost his ability to work, drive, play golf, read, cook, and enjoy a glass of wine. He can no longer dress, bathe, or feed himself. He lost his sense of humor, he lost his personality, and he lost his dignity. He lost it all.

Almost 3 years ago, I had to place Ralph in an assisted living facility for dementia patients, and he resides there today. Frankly, my husband no longer has a life, and he certainly does not have a life that he would want for himself. And he does not have a life that he and I would want for anyone else.

In almost 15 years since our ordeal began, we have been through many ups and downs. You have a spouse who becomes aloof, disconnected, irresponsible, who may be hostile and you don't know why. The diagnosis is frightening, but it is also a relief. You finally understand why these things are happening. It is not you, it is not him, it is an illness.

I cared for Ralph at home for over 7 years and I learned: Living wills, power of attorney, guardianship, Social Security, home care, adult medical daycare, psychiatric admissions, long-term care, et cetera, et cetera. These experiences are similar to those of anyone caring for someone with dementia, but there are some nuances when caring for an NFL player.

I also learned that our current infrastructure is based on providing services for your grandmother, not for a very large man. The staff at these facilities are afraid. They are intimidated. I had to buy a full-size bed for my husband because these facilities provide a twin bed that was much too small for him. My husband was

lucky in one way. He has a wife who is educated, who works in health care. She is the one who filled out all the forms. She has a good job with a company that offers excellent health care benefits, and she also happens to be one very pushy broad. So Ralph has fared well because he has had a very strong advocate.

But there are many out there in the situation that Ralph and I have been in over the last 15 years, and they need help. I speak with family members regularly, and I help them find doctors and other services. Often I simply just talk to distraught women and help them get through it. They turn to me because they have no place to go and they are finding their way the way I did years ago.

So what are my asks today? What do I want to see come out of this? I have four. The first is that the NFL must stop its denial of the relationship between brain trauma and brain disease and become a proactive leader that it should be. The evidence is there. The denial is disrespectful of the players and the families that are suffering, and it endangers current players and children.

Second, the NFL must do more to protect current players and children so they are not faced with this travesty later in life. The NFL is in a prime position to educate on and advocate for prevention, and it is a moral imperative.

My third ask is that the NFL go beyond the 88 Plan, which assists players diagnosed with dementia. Players and families suffer for many years before the diagnosis comes. The NFL must educate and find players with early signs and symptoms to provide support so their families can better manage the ordeal before them. This is not an academic exercise. This is something that the NFL should be doing for all of the players, not a handful or a group of players that participate in a study. For former players like Mike Webster, the diagnosis came too late.

Lastly, I mentioned earlier that I wear a second hat as a researcher. My fourth ask is that you examine carefully the studies put before you. Some will tell you these studies should be disregarded or that they have been misreported or that they have been exaggerated. I encourage you to talk with third-party experts about the quality of these studies. There are different kinds of bias. There is the bias of an opinion. Of course I have a bias with my husband being where he is today. I have a bias about the studies. The NFL has its bias about the studies. But there is also other kinds of methodological bias, and I encourage you to listen to experts about those kinds of things and to listen to the experts about the issues of statistical power.

And I provided more details about this and examples in my written testimony. I know that you are not doctors and I know that you are not scientists, but I know and I have the confidence that you are able to understand clear information that is provided to you in these studies, especially with the assistance of third-party methodologists who can make all of this very clear, and I thank you for letting me be here today.

[The prepared statement of Ms. Perfetto follows:]

PREPARED STATEMENT OF ELEANOR M. PERFETTO

Written Testimony of Eleanor M. Perfetto, Ph.D., M.S.

Wife of Ralph R. Wenzel Former NFL Offensive Lineman
and Senior Director, Pfizer Inc.

United States House of Representatives
Committee on the Judiciary

Hearing on "Legal Issues Relating to Football Head Injuries"

Wednesday, October 28, 2009

Chairman Conyers and Committee Members, thank you for inviting me to appear before you today. My name is Doctor Eleanor Perfetto. I am a pharmacist with a Ph.D. degree in public health, having concentrated my work in health policy and epidemiology. I currently am employed by Pfizer Inc. I tell you that because I wear two hats today, predominately one as a wife and caregiver, but also one as a health researcher who understands the study of disease and treatments in populations and who understands research methods and study biases.

The topic of "the lasting impact of head injuries suffered by National Football League (NFL) players" is very important to me and has been for almost 15 years. I want to tell you about my personal experience and provide suggestions about urgent actions that need to be taken by the NFL to help disabled retired players, current players, and children involved in sports today.

My husband, Ralph Wenzel played as an offensive guard in the NFL for seven seasons. He retired in 1974 and became a high school- and college-level physical education teacher and football coach. In 1995 -- over 20 years after his retirement from the NFL -- my husband began having vague and disconnected symptoms: depression, general uneasiness and anxiety, always losing things like his wallet or checkbook. Today we recognize those symptoms as resulting from chronic traumatic encephalopathy (CTE). In the following years, Ralph began to suffer obvious memory loss and confusion. In the fall of 1999, ten years ago, at the age of 56, Ralph was diagnosed with mild cognitive impairment, or MCI, a condition known to progress to Alzheimer's disease.

Ralph's condition did progress over the last 10 years to full dementia related to CTE. I can't tell you on what day his condition flipped from MCI to dementia. However, in those 10 years, he lost his ability to work, drive a car, play golf, read the biographies he loved, cook gourmet meals, and enjoy a glass of wine. He can no longer dress, bathe, or feed himself. He lost his dry sense of humor. He lost his warm, quiet personality. He lost it all. Almost three years ago, I had to place my husband in an assisted living facility for dementia patients and he still resides there today. But frankly, my husband no longer has a life, certainly not one he'd want for himself.

I don't want to see this happen to anyone else.

In the almost 15 years since our ordeal began, Ralph and I went through many ups and downs. In those first few years, we had no idea what was wrong. You have a spouse who is aloof, disconnected, irresponsible, whose personality is changing, who may be hostile and you don't know why. It made life difficult and I admit that before Ralph's diagnosis, I considered divorce. The diagnosis was frightening, but it also was a relief. I finally understood why these things were happening; it's not me, it's not him, it's an illness.

After the diagnosis, I cared for Ralph at home for over 7 years and I learned. I learned about living wills, power of attorney, guardianship, social security, home care, adult medical day care, psychiatric hospital admissions, assisted living, etc., etc. I was on my own.

While these experiences are similar to those of any family member caring for someone with dementia, I also learned that our country's current infrastructure in adult day care and long-term care facilities are based on providing services for your grandmother, not for a 6 foot 2 inch, 225 pound man. For example, I bought a full size bed for Ralph because he did not fit in the twin bed his facility provided. He has caregivers that I have hired, in addition to those who work for the facility, to insure he gets individual attention and extra exercise during the day to keep him from jogging around the halls and jeopardizing other residents' safety. Old habits die hard. And what is particularly hard to overcome is that staff at these facilities are afraid, and in some cases rightly so.

My husband was lucky in one way. He has a wife who is educated, a wife who works in healthcare and can battle the healthcare system, one that has a very good job with a company that offers excellent health benefits, and she also happens to be a very pushy broad. So, Ralph has fared well because he has a strong advocate.

But, there are many players out there in the situation Ralph and I were in 15 years ago, ten years ago, five years ago, and they need help. They need the relief of understanding what is going on and help wading through the system. I speak with many NFL retired player spouses on a regular basis and I work to help them find doctors, assisted living facilities, and other services. Often, I simply just talk to distraught women at the end of their rope and help them get through it. They turn to people like me because they have no place to go and they are finding their way the same way I did years ago.

So what are my "asks"? What do I want to see come out of today? I have four.

First, the NFL must stop it's denial of the relationship between brain trauma and brain disease. The evidence is there. Once the denial stops, the NFL can become the proactive leader it should be. The denial is disrespectful of the players and families who are suffering and it endangers current players and children who are at risk for injury.

Second, the NFL must do more to protect current players and children so they are not faced with this travesty in later life. There is no treatment or cure for CTE. Right now

there is only prevention. The NFL is in a prime position to educate on and advocate for prevention. It is a moral imperative. Specific suggestions on how sports and the game of football can be made safer I leave to experts in that area, who I am sure will make those suggestions today.

In 2007, the NFL instituted the 88 Plan, named after Baltimore Colts hall of famer, John Mackey as the result of advocacy efforts by John's wife, Sylvia. John is also in assisted living now. The 88 Plan is offered to eligible retired NFL players diagnosed with dementia and covers medical and long-term care costs up to $88,000 per year. Ralph's long-term care costs have been covered by the 88 Plan since spring 2007.

My third ask is that the NFL go beyond the 88 Plan. It must educate players and the public about CTE, and must find players with early signs and symptoms to provide support so they and their families can better manage the ordeal that is before them. The 88 Plan assists players who are diagnosed with dementia. They and their families have suffered for years before that diagnosis comes. For former players like Mike Webster, the diagnosis came too late. The numbers indicate we are seeing the tip of the iceberg.

Lastly, I mentioned earlier that I wear a second hat as an epidemiologist. That means I have been trained to study disease and treatments in the population. I am more versed than most in the types of studies that have been and are being conducted, and the methods issues and biases encountered in doing this research. My fourth ask is that you to examine carefully the studies put before you. There will be people today who will tell you that some of the studies should be disregarded, or that some are flawed. I encourage you to consider two specific issues you may not be familiar with.

One is the issue of statistical power. This is a mathematical calculation that tells you a study is large enough, it includes enough people, to be able to find a difference between two groups. If the study is too small, a researcher can erroneously conclude that there are no differences between the two groups. In reality, not enough people were included and differences could have been seen if only more people were recruited.

The second issue is that of recruitment bias. This simply means that you may have recruited a certain type of person in your study or left out certain types of people because of the way that you recruited participants. This bias can mean that your study findings are too low or are too high, depending on the direction of the bias. But, it does not mean the study should be discounted in its entirety. I provide an example of this in my written testimony that I ask you to consider.

Allow me to provide a relevant example. If I send out a survey to retired NFL players to ask them about cognitive problems and dementia, and I use a mailing list of retirees who are members of a club, I likely will have a response bias. To belong to the club, you must be healthy enough to make the decision to join, fill out an application form, and write a check for membership. If you have dementia, it is unlikely you can do those things and it's unlikely your caregiver will take the time for you. So, you are not even a club

member and are not on the mailing list at all. You have the disease I am looking for, but you are left out.

If you were well when you joined the club but developed dementia after, then you would be on the mailing list. But, when the survey comes you may no longer live at home. If you do live at home you may no longer receive the mail and you probably can't read the mail. Again, it's unlikely your caregiver who gets the mail has the time to respond. So, your response would never be sent in and, again, you will be left out.

Who is sending a response in? Those responding are retirees healthy enough to become club members, who are still well enough to live at home to receive the mailing, who are well enough to read the mail, and who are well enough to answer the questions and put the response back in the mail. It is likely that these are not retirees with dementia or other neurological or mental health conditions.

The study has a bias because those you are trying to find, those with cognitive problems or dementia, are reached in fewer numbers due to decision to use the club list. Some people will tell you that this means the study is fatally flawed and cannot be used. In fact, the study is not flawed for just having a bias. You can interpret the data as long as you understand and recognize the direction of that bias. In this example, it means that any estimate you arrive at on the extent of cognitive problems and dementia in the population is probably too low. It means the problem is probably worse than what you have found. It means there are probably more people who need help than you thought.

I thank you for this opportunity to speak to you and I am happy to answer any questions you may have.

Mr. CONYERS. We are grateful to you for your presentation and some relation of your experience, your very personal experience. The four asks we are going to take into careful consideration. And so I am going to excuse you now, because I know of your previous commitment. But thank you very much for joining us this afternoon.

We now turn to the former running back for the New York Giants, Tiki Barber, who set virtually every career offensive record for the Giants. And being voted three times NFL Pro Bowl, all time records with the Giants for a number of things. And we are lucky to get this perspective, because here is a person that retired at a relatively young age, and he is now a correspondent for the Today Show.

Welcome, Mr. Barber.

TESTIMONY OF TIKI BARBER, RETIRED NFL PLAYER

Mr. BARBER. Thank you, Chairman. I appreciate you being here. I appreciate being here. Mr. Goodell, it is good to see you as well.

It is a privilege and an honor, and also a little bit of source of entertainment to hear some of the tangential conversations surrounding our discussion on brain injury. I have one ask of this Committee, and I will be brief. And I will get to it shortly.

I played football for 10 years. I had exactly two concussions, both of which I came back from in the same game. I was not affected. As you mentioned, I retired really for a quality of life decision, so that I didn't lose my knees, I didn't lose my cognitive abilities, and I could live a productive life.

My other hat that I wear, as you mentioned, is with the "Today Show" and "NBC News." And a story that I have been working on recently involves new helmet technology and the troubles that high school kids have with concussions. In the course of our research and our studies, we met with Vin Ferrara, who is here. He is the creator of a new helmet called a Xenith. But what he told me most that troubled me about high school athletics is that less than half of high school teams have access to an athletic trainer. Now, you can all understand why that can be dangerous.

In the National Football League, as much as you hear the anecdotal evidence, you hear the bile that comes from people who think that the NFL is not addressing this issue. At the end of the day, it is a player's choice. When we get injured, when we break our arms, when we break our fingers, when we pull our hamstrings, when we get concussions, ultimately the doctors give us advice, but it is our choice to go back into the football game. At a high school level, it is not so much so because they do not have the advice.

My ask of you is that you find a way to mandate that every high school athletic program has access to medical doctors who can diagnose, understand, and treat concussions so that kids who are trying to emulate and be like me and be like the current players in the National Football League know the dangers of playing the sport that we all love.

I thank you for your time.

Mr. CONYERS. That is a very important aspect that sort of blends into our next witness, Dick Benson, who as a result of the tragedy in his family has a Texas law named after his son. And it goes to

the same point that has been raised, the hundreds of teenagers who have been seriously injured, some killed, because of their lack of information about concussions.

Welcome, Mr. Benson, to our hearing. And you may proceed.

TESTIMONY OF DICK BENSON, HIGH SCHOOL FOOTBALL SAFETY ADVOCATE

Mr. BENSON. Thank you, Mr. Chairman, and Members of the Committee for the honor to testify in front of you. I have a short story to tell about the untimely death of my 17-year-old son, excuse me, who died of a head injury he received in a football game. And this football team had trainers and had doctors and is an elite private school. It had generally the access to the best of everything, but it wasn't effectively employed. We had a team doctor, for example, but as is common in Texas and maybe in the rest of the country, the team doctor was an orthopedic surgeon. And for all I know, he may have been the best orthopedic surgeon in Austin. But he admitted later under oath that he didn't know how to diagnose a concussion, and yet he was a team doctor of our team.

These kids die of head, neck, heart, heat, and asthma-related injuries. That is what kills them. They don't die of orthopedic injuries. Now, if orthopedic doctors want to be team doctors, if it is a franchise that is commercially or morally valuable to them, I think that is great. I simply ask that they get the training in emergency sports medicine that will enable them to be qualified to handle these kind of injuries.

Additionally, our law, called Will's Bill, after my son, requires that the coaches, the trainers, the sponsors of any competitive activity in public schools in Texas get that training. That includes band directors. And the reason we have band directors is you know we have 105 and 100-degree days in Texas in August when the band is working out, and we have had heat-related injuries on the part of band members. So those band directors need to have the same kind of training for heat-related injuries.

I think most importantly, what we have asked for, and frankly I am sorry to say that the most uncertain I am about the legal compliance, is the training for the kids. You know, we have a concept in our society called informed consent. And I don't think anybody can make the argument that a 16 or 17-year-old kid, no matter how intelligent or no matter how emotionally mature, can give informed consent unless he has gotten the information. And we require that in Will's Bill. And I am not completely sure it is being delivered.

The gentleman on my left, Mr. Nowinski, has written an outstanding book about the issues of concussion and head injury called Head Games. I refer it to all of you. And I challenge you to read it and not come back with a moral sense of the necessity for action.

Now, there has been some earlier objection that maybe the Congress shouldn't be making these rules, maybe the NFL and the players union shouldn't be making those rules—or should make them for themselves. Who speaks for the 2 million young people who benefit or suffer from those rules? Nobody in that setup. I think you should make some rules because you can. And if you

don't want to, I would like to see your list of who you think is going to step in.

Getting Will's Bill passed in Texas was very difficult. It took 4 years. It took two professional lobbyists. It took lots of money. It took lots of phone calls. It received virtually no public opposition and received massive private opposition from that huge slice of Texas culture that is concerned with football. I don't know if you know or not, but in small town Texas, and I would include some pretty affluent suburbs of big towns in this particular definition, the most important man is the football coach. And if you are running for public office in Texas on a statewide basis, you make it your business to try to get every football coach you can to be an endorser of your campaign because they have so much to say about the future of the children.

So football is part of Texas culture. And I must say, based on my observation beyond that, it is a cult as well. And like most Americans, you know, we all love not to be told what to do. Simultaneously, we love to tell other people what to do. And I am sure that describes me as well as it does the football culture.

But finally, we made some progress frankly because we made a breakthrough with a male coach who was the head of the girls' coaches association in Texas. And he came in and he persuaded the boys' football coaches, and they persuaded our public entity, the University Interscholastic League that is responsible for all of this, and we finally achieved it, and we had broad bipartisan support, and it was signed by the Republican Governor of Texas, Governor Rick Perry, in 2007.

So my one request is don't let it happen again, please. Thank you.

[The prepared statement of Mr. Benson follows:]

PREPARED STATEMENT OF DICK BENSON

Testimony of Dick Benson for the
U.S. House of Representatives Committee on the Judiciary
Full Committee Hearing on
"Legal Issues Relating to Football Head Injuries"

I was born in Dallas in 1949, and graduated from the University of Texas at Austin in 1974, where I served as student government president. Upon graduation, I worked in a variety of business ventures in the state of Texas and am currently retired. I had three sons, two of which are deceased, including William Benson.

On September 17, 2002, my son Will, a quarterback at St. Stephen's Episcopal School in Austin, collapsed during a football game, went into a coma, and died six days later. Doctors concluded that his death was caused by a helmet-to-helmet hit suffered a few weeks earlier.

In 2003, with the help of friends and supporters, I founded the Will Benson Foundation for Sports Safety. In light of Will's death, the Foundation concluded that the most significant contribution it could make was to pass a law to raise safety standards for school sports. As a result, the Foundation drafted "Will's Bill," and succeeded in having it introduced in the Texas state legislature. The original draft of Will's Bill contained requirements for specialized training for all people involved in school sports, including coaches, players, and doctors, as well as criminal penalties for people involved in school sports whose actions contributed to a player's severe injury or death. Will's Bill went through a series of committee hearings, and the Foundation utilized the services of both Democratic and GOP lobbyists. The Texas Medical Association aided the Foundation's efforts, putting forth reports indicating that most high school football team doctors were unqualified to treat football injuries. In Will's case, his team doctor was an orthopedic surgeon who was unskilled in the treatment of common football ailments such as concussions and heat stroke.

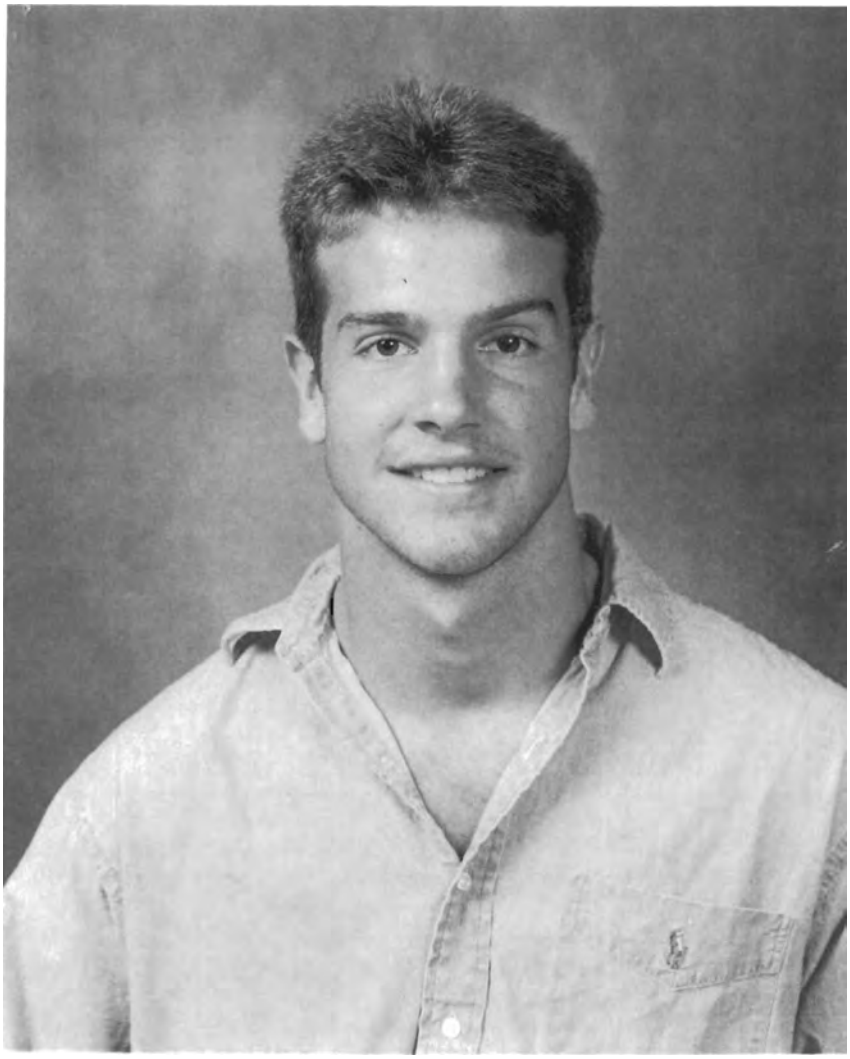
Will's Bill received public support, but faced very stiff opposition below the surface. Football is a major part of Texas culture, especially in the small towns where the central figure in the community is often the HS football coach. High school football coaches, like most Americans, have two distinct characteristics: they don't like to be told what to do, and they like to tell everyone else what to do. Accordingly, high school football coaches opposed intervention in the sport by government officials outside of the football culture, and as many Texas politicians rely on football coaches to win re-election, Will's Bill met resistance.

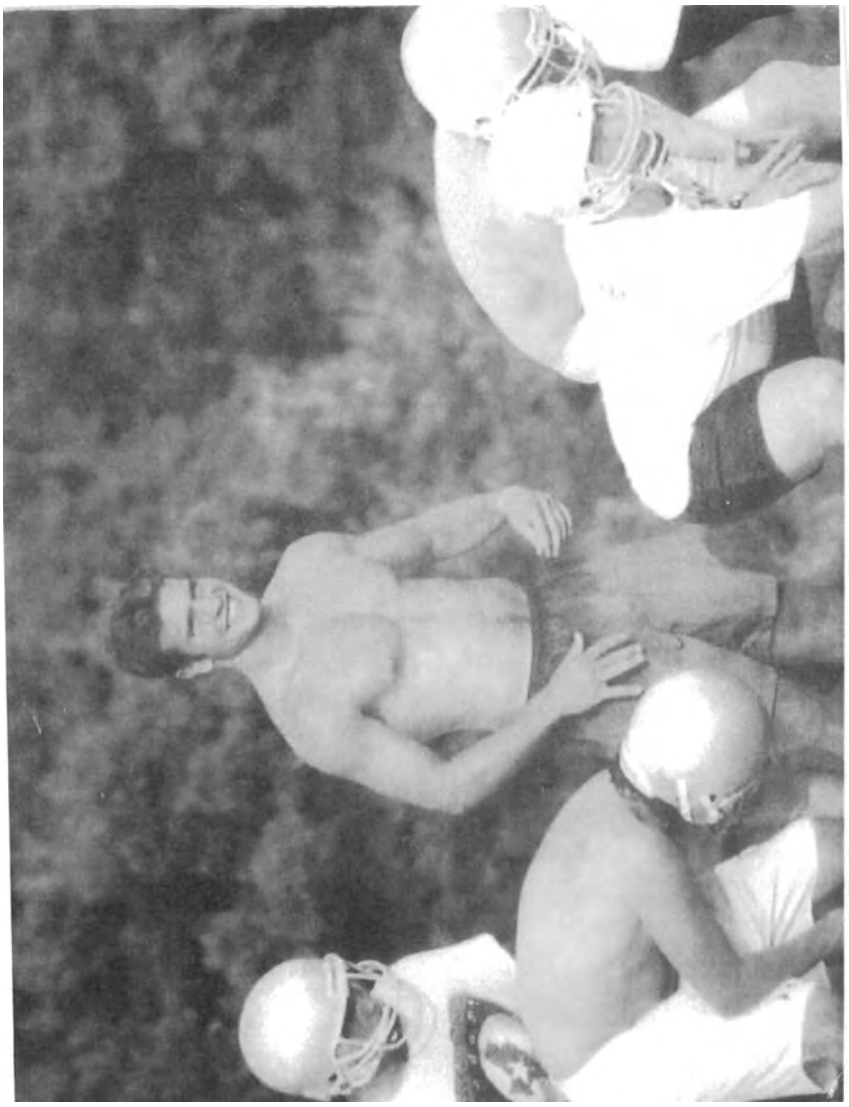
After four years, Will's Bill eventually passed, but passage required more compromise than was desired. While I would like to believe that the bill has helped foster this type of safety culture throughout Texas public school sports, I feel that in many ways the law is a statement

encouraging safety rather than a forceful policy to protect student-athletes. The training requirements in the bill remained intact, and many school districts, such as the Austin Independent School District, have adopted a "safety culture" that encompasses not only football, but all other sports and even band. However, the criminal penalties in the original bill were replaced by a toothless compromise to let the individual school districts determine their own guidelines to punish personnel who contribute to the severe injury or death of student-athletes.

I believe that the ultimate solution to improve safety conditions for student-athletes, particularly football players, requires four major policy initiatives. First, student-athletes require the best equipment available to prevent serious injury. Second, school sports should be conducted according to the best safety measures developed. Third, the idea of student-athletes as tools in the equipment locker needs to be replaced with a conception of student-athletes as human beings susceptible to injury. Fourthly, the game of football should be changed to reduce harsh physical contact, especially helmet-to-helmet contact. Above all else, the play in football that kills and maims is called spearing; this was the type of play that ultimately led to Will's death. In my opinion, spearing needs to be harshly punished by referees, and players that spear should be subject to expulsion from the game and, for repeated offenses, expulsion from the sport.

ATTACHMENT





Mr. CONYERS. Thank you very, very much, Mr. Benson.

Chris Nowinski is the former World Wrestling Entertainment professional wrestler who turned his background as a Harvard football star into one of the most entertaining and probably hated characters on television. He debuted on the World Wrestling Entertainment flagship program in 2002, when he was named newcomer of the year, and was the youngest male hard core champion in history before his career was ended by a 2003 concussion. And he began a quest to better understand his condition. And his relentless effort has resulted in a lot of educational work. And he specializes in

commercial strategy and licensing. And if I am not mistaken, he has also published a book on the subject.

We are very pleased to have you here, Mr. Nowinski.

TESTIMONY OF CHRISTOPHER NOWINSKI, CO-DIRECTOR, CENTER FOR THE STUDY OF TRAUMATIC ENCEPHALOPATHY, BOSTON UNIVERSITY SCHOOL OF MEDICINE

Mr. NOWINSKI. Thank you. Mr. Chairman, Ranking Member Smith, and Members of the Committee, thank you for the invitation to testify today on an issue that has become my life's work.

My name is Chris Nowinski, and I am a Co-Director of the Center for the Study of Traumatic Encephalopathy at Boston University School of Medicine, and also Co-Founder, President and CEO of the nonprofit Sports Legacy Institute, which is dedicated to solving the sports concussion crisis, as well as a member of the board of directors of the Brain Injury Association of America. But when it comes to my personal identity, I will always see myself as a former Harvard football player. And I hope to provide a unique perspective as a former player, current brain trauma researcher, and post-concussion syndrome survivor.

When I learned I was following Merrill Hoge, whose story he shared with me for my book Head Games, I realized that you don't need to hear my personal story. You only need to know that I also lost my career as a professional wrestler with World Wrestling Entertainment and then lost the next 5 years of my life to post-concussion syndrome all because I ignorantly tried to push through concussions.

After the damage was done, I was lucky enough to find Dr. Robert Cantu. He taught me for the first time that repetitive brain trauma can lead to cumulative damage. Second, he told me that had I rested any of the concussions I had received, I would have limited that damage. But it seemed very strange to me that I was a 24-year-old with a Harvard degree and over 11 years of brain trauma under my belt, and I had no idea the risk I was taking or how to protect myself. When I began asking around with the men I played with, I learned that no one had told them either. And that is when, 6 years ago, I decided to dedicate my life to this issue. But while 6 years ago I had a notion that something was wrong with football and other contact sports, now when led to the diagnosis of CTE by Dr. McKee and others, and the diseased and battered brains of ex-football players, combined with the lack of awareness of the consequences of brain trauma, I am certain that radical measures are needed for football to continue safely.

CTE is an ugly disease that slowly kills brain cells and connections. I don't know if I have CTE inside my head right now because today we cannot diagnose it while someone is alive. But it doesn't matter if I know, because we cannot treat it and we cannot cure it. Today we can only prevent it.

But to do this, we have to dig deep and find the will. Because this Friday night in towns across America you can be sure we are creating it. This Friday night over a million kids will take to the football field, one in eight boys in America. One in eight boys plays football at the high school level. And thousands will suffer concussions.

One, a fictional boy we will call Mike, will take a hit to the head number 1,000 this season. But this one will make him feel stunned and confused. And he will see double and forget where he is for a few moments. He will begin walking toward the wrong sideline, a clear indication he is concussed. And his coach, who is a good guy, but was never trained on the dangers of concussions, will see it and think, oh, he just got a little dinged. The referee will notice, but he won't know if it is his place to say something. Sometimes an athletic trainer might notice, but Mike's high school is one of the 58 percent without one. So Mike won't know to say something because Mike's brain isn't functioning correctly. So a teammate will grab Mike by the jersey and pull him back into the huddle. Mike's parents will notice from the stands, but they don't understand. All 10 other guys in the huddle will see that Mike's concussed, but that happens all the time. So instead of calling time out, they just keep telling him the play over and over when he forgets while walking to the line of scrimmage. The teammates don't know that by playing, Mike is exposing himself to further brain damage or sudden death from second impact syndrome. After a few more plays, Mike appears better, although he has a raging headache he doesn't tell anyone about. The concussion is never diagnosed.

What happens to Mike? I don't know. He might be fine or he might be laying the groundwork for CTE, or next week he might get another concussion, and if that doesn't kill him, the post-concussion syndrome might be so bad that he can't focus in class, his grades slip, and he becomes unmotivated, and his promising life becomes permanently derailed. While the discussion of the concussion crisis has primarily been focused on the professional game, the focus needs to be on youth football.

As we now think of how to solve this crisis, remember that 95 percent of the players are under the age of 18 and under the age of consent, as Mr. Benson said. So the idea that we know what we are getting into is erroneous. The fact is we aren't even giving these kids a chance to protect themselves. In fact, for most kids, the only source of this information would be the great work that is coming out of the New York Times, because there is no formal education for kids.

So when I think of the immense scope of the problem, I am reminded that football has not always been played as it is today. In 1905, the game was so dangerous that President Theodore Roosevelt summoned leaders to Washington for a summit on how to make the game safer. He threatened to take action in the absence of significant reform, and he got it.

Today it is important to realize that football has evolved into something it was never intended to be. I believe the CTE research has shown us that it is time for a new change, and maybe even a new committee like Roosevelt's. Except this time I think it is a committee to save football, because we cannot in good conscience allow this scenario to continue.

If we agree that the game is broken and needs to be fixed, we can develop a solution, and that solution may be easier than we think. Today the members of the Sports Legacy Institute, including doctors and ex-NFL players, posted a 10-point plan on how to save

football at our Web site at sportslegacy.org, which I would like to enter into the record.

Mr. CONYERS. Without objection, it will be.

[The information referred to follows:]

Sports Legacy Institute
230 Third Avenue
Waltham, MA 02451
www.sportslegacy.org

Christopher Nowinski, President
D 781.487.7300 x169
F 781.487.7301
nowinski@sportslegacy.org

10 Point Plan to Save Football

In the past few years, former football players have begun being diagnosed with Chronic Traumatic Encephalopathy (CTE), a progressive neurodegenerative disease caused by repetitive trauma to the brain which eventually leads to dementia. Some were famous NFL Hall of Famers like Mike Webster and Lou Creekmur. Others, like Mike Borich, only played through college. All died sooner than they should have, and all suffered terribly in their final years.

Since the discovery of CTE in 1928, the disease has been seen almost exclusively in boxers, which is why it is often referred to as "punch drunk" syndrome. However, it is now diagnosed regularly in ex-football players, and in the past year, the Center for the Study of Traumatic Encephalopathy at Boston University School of Medicine (CSTE) has diagnosed CTE post-mortem in 11 of 11 former college and professional football players that died at ages ranging from 37-82 years. This is significant, as the disease should not naturally exist in a single human being. The early stages of the disease have even been seen in an eighteen year-old former football player. In 2009, it is clear that football is in the midst of a brain trauma crisis.

The game of football has not always been played as it is today. In fact, the most consistent aspect of the game has been change. In 1905 the game was so dangerous, regularly killing participants, that President Theodore Roosevelt summoned the coaches of Harvard, Yale, and Princeton to Washington D.C. for a summit on how to make the game safer and threatened to take action in the absence of significant reform.

From this meeting the American Intercollegiate Football Rules Committee was created, and that Committee, among other things, legalized the forward pass and made other changes to eliminate dangerous collisions. Over and over, football has had to be changed to be made safer. Now it faces a new challenge. CTE is a deceptive, quiet killer. The disease begins during a player's career and then hides, slowly killing brain cells until the athlete begins showing symptoms years later.

Football has evolved into a something it was never intended to be.

Football collisions may now be more dangerous for the brain than ever. With the combination of bigger, stronger, and faster players and hard-shelled helmets that are often used as a weapon to initiate contact, we've created a type of repetitive trauma to the brain that has never existed before.

The discovery of CTE inside the brains of so many ex-football players has shown us that it is again time for change, and a new Committee. Only this time, it is a Committee to Save Football. Among high school students, football is the most popular sport in America, played by one in eight American boys. While football was first played by colleges, today football is a children's game, with 95% of participants under the age of 18.

These children are not old enough to make informed choices. Therefore, in light of the new evidence of CTE in 100% of players studied at Boston University, it seems appropriate that we again reevaluate how

sports

Sports Legacy Institute
230 Third Avenue
Waltham, MA 02451
www.sportslegacy.org

Christopher Nowinski, President
D 781.487.7300 x169
F 781.487.7301
nowinski@sportslegacy.org

we play the game of football before the 2010 season and at all levels of play: youth, high school, college, and professional.

If we can agree that the game is broken and needs to be fixed, we have an incredible number of paths to a safer game **without fundamentally changing football.** If we know that practice collisions account for over 50% of brain trauma, the proposals below could easily eliminate over 75% of brain trauma and concussions today – it is simply a question of leadership.

Below are 10 paths to a safer game that can and should be used to reduce brain trauma. This would serve as the basis for evaluating the options available to the Committee to Save Football.

1. Reevaluate how the game is **practiced**
    - Greater than 50% of hits to the head occur outside of games. NFL teams rarely hit in practice due to risk of injury. Youth teams could only be allowed to have full-contact once a week. Dangerous drills could be banned or used less frequently.
2. Encourage mandatory brain trauma and concussion **education** for coaches, athletic trainers, parents, and athletes
    - Coaches, athletic trainers, and athletes cannot diagnose concussions if they aren't trained to look for them or know how to recognize them. Coaches, athletic trainers, and athletes will not voluntarily choose to rest concussions and reduce overall brain trauma if they don't understand why it is good for the athlete's short and long-term health.
3. Reevaluate **protective equipment**
    - Investigate changes to helmets, shoulder pads, and other types of protective equipment to reduce brain trauma.
4. Develop better methods of concussion detection and **diagnosis**
    - The CDC provides clipboards with concussions diagnosis protocols on the back at no cost. Coaches could be required to carry them. We can invest more in research to find simple, objective ways to diagnose concussion that can be utilized in any program.
5. Develop better methods of concussion **management**
    - Return-to-play too soon after concussion can result in more extensive brain damage, and can actually result in death. It is now law in Washington state that players are required to see a medical professional with brain trauma expertise before return-to-play. Minimum return-to-play standards should be enforced at all levels.
6. Consider minimum **medical resources**
    - Football is a dangerous game. Minimum medical resource standards, like having an athletic trainer or doctor on the sideline, should be considered.
7. Reevaluate **techniques** of tackling and blocking
    - We can teach and enforce different methods of tackling and blocking that minimize contact to the head.

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F 781.487.7301
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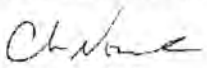
8. Reevaluate the **rules**
    - Recently the NFL banned the wedge on kickoffs to reduce trauma. Many other rules could be changed, at all levels of football, to reduce brain trauma.
9. Reevaluate **rule enforcement** and the role of **referees**
    - The NCAA recently began suspending players for intentional helmet-to-helmet hits. Referees could eject players for illegal hits to the head. Referees could be trained to identify concussed players on the field.
10. Reconsider the **culture** of the game
    - Television announcers could stop glorifying illegal hits. Children could stop being pressured to play through concussions.

The evidence now exists to support immediate and radical change to the game of football to dramatically reduce brain trauma. Let us not let this opportunity pass.

Respectfully submitted October 28, 2009.



Christopher Nowinski
Harvard Football 1996-1999
Sports Legacy Institute | President
Center for the Study of Traumatic Encephalopathy
Boston University School of Medicine | Co-Director

Mr. NOWINSKI. Thank you.

The document highlights 10 different proposals to create a safer game. And everything is on the table, from rule changes to mandatory education. The first proposal, to reevaluate how we practice, could cut the number of blows to the head in half. Imagine if we only allowed hitting 1 day a week. The plan as a whole could easily eliminate 75 percent of brain trauma and concussions without fundamentally changing football. It is simply a question of leadership.

So much of this crisis has mirrored big tobacco and the link between smoking and lung cancer. And I ask you if you were able to create all the smoking laws and awareness we have today back in the 1950's when the first conclusive pathological research was done linking smoking to lung cancer, would you save those millions of people who smoked without understanding the risks?

As you listen to Dr. McKee next describe these diseased and battered brains of former football players, think of it as if you are hearing the first cases of pathologically described lung cancer from smoking. But in this case remember that the choice these men made to play football was made when they were just children. And then think about what you are willing to do to ensure this doesn't happen to future generations. Although there has been progress, the NFL has not been eager to take this on. So maybe it is time for another committee, a committee to save football. Let's not let this opportunity pass us by.

Thank you.

[The prepared statement of Mr. Nowinski follows:]

PREPARED STATEMENT OF CHRISTOPHER NOWINSKI

CENTER FOR THE STUDY OF TRAUMATIC ENCEPHALOPATHY

Written Testimony of Christopher Nowinski
Co-Director, Center for the Study of Traumatic Encephalopathy
Boston University School of Medicine

President and CEO, Sports Legacy Institute

Before Committee on the Judiciary
United States House of Representatives

Hearing on "Legal Issues Relating to Football Head Injuries"

Wednesday, October 28, 2009

Mr. Chairman, Ranking Member Smith, and Members of the Committee, thank you for the invitation to testify today on brain trauma in football, an issue that has become my life's work. My name is Chris Nowinski, and currently I am a Co-Director of the Center for the Study of Traumatic Encephalopathy at Boston University School of Medicine, and Co-founder, president, and CEO of the non-profit Sports Legacy Institute, or SLI, which is dedicated to solving the sports concussion crisis, and also a member of the board of directors of the Brain Injury Association of America.

When it comes to my personal identity, I will always see myself as a former Harvard football player, and I hope this enables me to provide a unique perspective as a current brain trauma researcher, and post-concussion syndrome survivor. I began playing football in high school drawn in by the spectacle on television and the opportunity to hit people as hard as I wanted without getting in trouble. As a two-way player in high school and an All-Ivy League defensive tackle at Harvard, I probably hit my head over one thousand times a year from the ages of 13 to 21.

The concussions began happening at Harvard, and continued when I became a professional wrestler for World Wrestling Entertainment, where I played an arrogant Ivy League snob - another story for another time. My concussions began happening so frequently, and with such severe symptoms, that I was forced to retire at age 24. I was left with an unreliable memory, daily throbbing headaches, depression, and even developed a dangerous sleepwalking habit. The first seven doctors I saw couldn't figure out why my last concussion was so devastating and why I didn't bounce back.

It wasn't until I met Dr. Robert Cantu, my cofounder at SLI and now co-director at the Center at BU, who is also testifying here today, that I learned what had been happening to me. He was the first person to ask me "How many concussions have you had?" I told him one. He was the first to also ask, "How many times have you been hit in the head and become confused, dazed, or considered yourself 'dinged?'" I said "Doc, that happens all the time." He said, "The symptoms you are experiencing are likely the result of cumulative trauma. In addition, the fact that you never took a day off for those injuries means that each one was more damaging than it needed to be.. Had you chosen to rest, you would have probably recovered by now."

That was the first I heard of cumulative damage, and the first I heard of resting concussions. There I was, 24 years old and a Harvard graduate, and I had no knowledge of the consequences of the brain trauma I experienced for eleven years. When I signed up to play at age 13 and was allowed to ram my head into my friends for fun, no adult around me thought it was appropriate to give me the information and training I could have used to protect myself. I lost five years to those headaches, and only recently began enjoying waking up to face a new day again. I first chose to dedicate my life to this issue because I don't want to see that happen to others.

But while there is a 'concussion crisis' in football, I've only recently realized the scope of the true elephant in the room, that of Chronic Traumatic Encephalopathy, or CTE, a degenerative brain disease caused by the thousands of hits that football players, and other athletes like boxers, hockey players, and soccer players, receive in the course of a sports career.

My colleagues testifying here today, Dr. Cantu and Dr. Ann McKee, will explain to you the nature of this devastating disease.

In layman's term, hitting your head thousands of times appears to create a disease that slowly and quietly causes your brain cells to die. It may be happening inside my head right now. If it is, once it reaches a tipping point, I'll begin showing symptoms that are cognitive, emotional, and behavioral. I'll begin changing, I'll begin losing control, and I'll begin losing myself. If I don't die from the cognitive and emotional problems that lead CTE sufferers to hearing voices, drug problems, and suicide, I will die with dementia that may last 30 years, and bankrupt my family, if they haven't left me already because of my uncontrolled aggression and violence.

I don't know if I have CTE, and it doesn't really matter, because today we cannot diagnose it while someone is alive. We cannot treat it and we cannot cure it. Today, we can only prevent it, but to do this we have to dig deep and find the will, because this Friday night, in small towns across America, you can be sure we are creating it.

We have no idea how widespread the disease really is. Dr. McKee has diagnosed it post-mortem in 11 of 11 former college and professional football players that died at ages ranging from 37-82. It has been found in men like Andre Waters, Tom McHale, John Grimsley, Wally Hilgenberg, Terry Long, Justin Strelczyk, Mike Webster, Mike Borich, and Lou Creekmur. The early stages of the disease have even been seen in an eighteen year-old former football player. It is certainly not 100% of football players that competed eight or more years, but it is certainly not a small percentage.

Today we can decide upon a denominator to elevate our level of urgency. If the next 89 brains we examine are negative for CTE, and only 11 of 100 football players suffer from this disease, is it still a problem? I think we'd all agree that yes, if 11% of athletes develop a devastating progressive brain disease solely because they chose to play a contact sport like football, we have a catastrophic problem. I can guarantee we won't find 89 healthy brains in a row, because we have yet to find one, so the only question left is, do we have the will to take action?

The public discussion, and the primary focus of these hearings, has been on the professional game, which is appropriate due to its visibility and prominence. The NFL sets the standard for the rest of football and their players are the role models for our young people.

It is also appropriate because the NFL has been the loudest and most significant voice dismissing the evidence that there is a problem in football. I don't know why they are so critical. Based on the research their own Mild Traumatic Brain Injury Committee has conducted, I am confident they are not sticklers for scientific truth. Whatever their motivation, for the last five years they have been a major impediment to children and parents learning about this disease, and taking steps to prevent it.

Some parents still see the NFL as something romantic, rather than simply another business owned by billionaires. Therefore, they still believe the NFL when they doubt the research on CTE, and they still sign up their kids with the dream of them becoming NFL stars, blind to the risks of the game.

As someone who showed up to class in college, I can tell you that when NFL spokespersons refute the risk of CTE by saying to the New York Times, "There are a great many people who have played football and other contact sports for many years and at high levels who do not appear to have suffered these types of deficits," they are being intellectually dishonest. People smoke and don't get lung cancer, but enough people do that if I lit up a cigarette in this room right now people would get angry and I'd be fined. Those at the NFL who give those quotes are not stupid, so belittling this important research with such pithy comments is something sinister, a choice to intentionally mislead the public about the risk that playing football has to their health. As someone who really could have used that information when choosing to play the game, it makes me more than a little upset.

So as we move forward, I hope we can recast this issue as a public health crisis. We must remember that 95% of football players are under the age of 18 and under the age of consent, so the idea that "we know what we are getting into" is erroneous.

- We must also remember that this affects millions of young boys. In fact, one in eight high school boys play football in America, and millions more participate at the junior high and elementary levels.
- We must remember that the young, developing brain is more sensitive to trauma.
- We must remember that younger players have weaker necks than adults, making head trauma more damaging to the brain. In fact, a recent study out of the University of Illinois actually found high school players take greater forces to the brain than college players.
- We must remember that most concussions, perhaps as many as 90%, go undiagnosed.
- We must remember than nearly half of players, even when diagnosed, return-to-play too soon, before their brains have had the chance to recover physiologically.

- And we must remember that most children don't have access to medical care or oversight at football practices and games. Less than half of high schools have athletic trainers.

As we try to assess the options available to us, we must remember that the game of football has not always been played as it is today. In fact, the most consistent aspect of the game has been change. In 1905 the game was so dangerous, regularly killing participants, that President Theodore Roosevelt summoned the coaches of Harvard, Yale, and Princeton to Washington D.C. for a summit on how to make the game safer and threatened to take action in the absence of significant reform.

Out of that meeting came the American Intercollegiate Football Rules Committee, and that Committee, among other things, legalized the forward pass and made other changes to eliminate dangerous collisions. Over and over, football has had to be changed to be made safer, but now we face a new challenge. CTE is a deceptive, quiet killer. The disease begins during a player's career and then hides, quietly killing brain cells until the athlete begins showing symptoms years later.

Football collisions may now be more dangerous to the brain than ever with the combination of bigger, stronger, and faster players and hard-shelled helmets that are often used as a weapon to initiate contact, creating a type of repetitive trauma to the brain that has never existed before.

The discovery of CTE inside the brains of so many ex-football players has shown us that it may be time for new change, and a new Committee. Except this time, it is a Committee to Save Football. In light of the new evidence of CTE in 100% of players studied at Boston University's Center for the Study of Traumatic Encephalopathy, it seems appropriate that we again reevaluate how we play the game of football before the 2010 season and at all levels of play: youth, high school, college, and professional.

If we can agree that the game is broken and needs to be fixed, we can pursue a number of paths to a safer game **without fundamentally changing football.** This morning we posted a 10 Point Plan to Save Football on the website of the Sports Legacy Institute at www.sportslegacy.org. The proposals include 10 different avenues to create a safer game. The first proposal, to reevaluate how we practice -how often we allow players to hit and the drills we use - could cut the number of blows to the head in half. Combined, the ten point plan could easily eliminate 75% of brain trauma and concussions. All can be enacted by the 2010 season. It is simply a question of leadership.

Part of the reason I have a voice in this debate, apart from my personal and professional experiences, is that in this debate I've always been reasonable, and when I've said the problem is worse that we realize, unfortunately I've been proven right. And with that in mind, I urge you to take swift action to change the course of this problem. This is not hyperbole, this is not exaggeration, this is not an emotional plea. This is a unique opportunity to change the course of the lives of millions of young men and women and to cut off a growing public health problem at the pass.

So much of this battle has mirrored the Big Tobacco problem of the last 50 years. I ask you, if you were able to create all the smoking laws and awareness we have today back in the 1950's, when the first conclusive pathological research was done linking smoking to lung cancer and cardiovascular disease, would you choose to save those millions of people who did not understand the risks of smoking?

In this case, we are dealing with children, and we are dealing with a problem that can be significantly remedied quickly and cheaply tomorrow. We just have to decide if we have the will.

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Mr. CONYERS. Thanks, Mr. Nowinski.

Mr. Benson?

Mr. BENSON. I am sorry, Mr. Chairman, but I forgot, I have a paper written by Vin Ferrara, who invented the Xenith football helmet technology. He is the CEO. It is a very well considered, carefully thought out paper, much like the one that Mr. Nowinski is

talking about. And with your permission, I would like to introduce it into evidence.

Mr. CONYERS. We would be happy to accept that paper, and thank you.

Mr. BENSON. Thank you, sir.

[The information referred to follows:]

BUILDING THE ENLIGHTENED WARRIOR

OCTOBER 25, 2009

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INTRODUCTION

Concussion awareness is rapidly expanding, thanks to the work of some courageous individuals. It appears the days of smelling salts and "you got your bell rung, get back in there" are coming to an end. The result should no doubt be a dramatic increase in neurological safety for all athletes. However, a side effect of this awareness is the perception that playing a contact sport, football in particular, destroys your brain. This perception is not accurate.

Football does not destroy your brain. Countless successful former football players are a testament to this. However, mounting evidence indicates that playing football in an extreme fashion might destroy your brain. Almost anything done to an extreme is unhealthy.

Concussions have clearly been an uncontrolled epidemic in football for decades. Epidemics are not instantly cured by simple solutions. They require complete strategies for risk reduction. The following outline provides a complete strategy.

BELIEVE IN PREVENTION

First and foremost, anyone involved in athletics should believe that prevention of neurological injury is of paramount importance. An undercurrent of "concussions are inevitable, we just have to manage them" permeates the sports world. Just because some concussions may still occur, this does not warrant an attitude of complete resignation towards preventing the injury. Prevention is possible. Prevention is critical.

IMPROVE UNDERSTANDING

The term concussion is inherently problematic, because it gives a vague sounding name to a tangible and dangerous injury. Most of the effects of a concussion are invisible symptoms; the definition of concussion is still evolving; and the awareness level of this injury varies greatly. Historically, a concussion was usually diagnosed only when a loss of consciousness occurred, perhaps making the injury seem rare. Actually, loss of consciousness is somewhat rare, while concussions are rampant.

Thus, diagnosis of concussion often hinges upon the player's level of forthcoming, and the experience and knowledge of the person making the diagnosis, if any. Concussions cannot be seen on conventional imaging scans. We now understand that the brain requires a significant amount of time to recalibrate itself after an injury, and that repeated injuries can have a host of significantly negative outcomes.

At Xenith we use the term **concussive episode**, as opposed to concussion, and invite others to join us. 'Episode' is a clinically useful term, describing something with a start and finish, and a variety of possible features and descriptors. With regard to concussive episodes, a long but generally accepted list of possible signs or symptoms may be included. Diagnosed concussions are included as concussive episodes. While the concussive episode may end, particular symptoms may linger indefinitely. The term concussive episode de-emphasizes "grading" a concussion (i.e. mild, moderate, severe) in favor of describing the episode's features; who is to say what is mild, moderate, or severe?

The term concussive episode eliminates the need to "diagnose" the concussion to make it real. It ends the confusion over so-called "dings or bell-ringers," or episodes of "seeing stars." They are all included because they are all real.

I've had one diagnosed concussion, but I've had five concussive episodes. One of these sent me to the hospital after about fifteen minutes of disorientation (as far as I know because I don't remember it), and resulted in me being held out of sports for a while. The other four episodes consisted of transient fogginess and visual disturbance, but through which I continued playing. I believe we can all agree that each of these five episodes, all of which resulted from head to head contact, belong on the same spectrum, and provide a better description of my history than stating, "I've had one concussion, but I know I've had my bell rung four other times."

It is evident that players of all sports experience many more concussive episodes than are actually diagnosed as concussions, perhaps ten fold more. Simply gather a group of players (preferably gathered by someone who has no influence on their playing time and promises them anonymity) and ask them how many have had concussions. Some will raise their hand. Then ask them how many have been hit and felt dazed or seen stars. Most will raise their hand.

IMPROVE THE CULTURE OF FOOTBALL

Many have heard the ubiquitous, "Football is not a contact sport. It is a collision sport." Sports Illustrated ran a cover story on big hits (warning of the culture of hitting), with a quote from a well-known player, stating, "The game is about taking another man down physically and mentally." Because of this mentality, big hits are rewarded, at least culturally, with cheering, highlight films, and awards with names like "Headhunter" and "Hammer." Young players proudly show off the marks on their helmets. "Gladiator" is the theme of choice.

However, a careful reading of the National Federation of High Schools Football Rule book, Section 1 Article 1, reveals the following:

> "It is the object of the game for one team to carry or pass the ball across the opponent's goal line or to kick the ball through the opponent's goal by a place kick or drop kick. The game is won by the team which accumulates the most points."

There is absolutely nothing in the rule book that rewards hitting; nothing about being a gladiator. The "rewards" are entirely cultural, and the dangers entirely real.

Most have come to expect and accept that football is an inherently violent sport, but it is really not supposed to be. It evolved from rugby, which is widely accepted as physical, but not necessarily described as violent. Should football be physical? Absolutely. Violent? This was clearly not the intention, and the result is neurological injuries.

Think about it this way: Who sends their kids out on Friday night to take another kid down physically and mentally? Who goes into coaching to teach kids to collide? Parents send their kids into football for its benefits, and coaches go into coaching presumably to provide these benefits to kids. Any good coach will spend more time talking about what players went on to do in life than they will spend talking about wins and losses (and those coaches usually have the most wins).

The media and imagery revolving around football is a huge problem. The violence and hitting are played up to the highest degree. Why? Because we watch, cheer, and pay. Responsible media outlets would do a tremendous benefit

to players everywhere by focusing on great plays, and not on big hits. Fans can do their part in small ways, like complaining to media outlets, and by not cheering as the big screen shows players headhunting.

Simply put, we must end the gladiator mentality that permeates football. In ancient Rome, a gladiator was defined as a professional combatant or a captive who entertained the public by engaging in mortal combat. While this sounds about right in describing football these days, at least at the highest levels, this must come to an end. If you want Gladiator, rent the movie. If you want collisions, go to a demolition derby.

It is critical to realize that football has always been popular, and will continue to be popular. The game can remain physical, fast, and entertaining, and will likely attract even more young athletes if it can become a safer activity. This is no longer about being a gladiator. It is about being an Enlightened Warrior.

IMPROVE THE GAME OF FOOTBALL

Football rules and techniques must be thoroughly examined, with the goal of eliminating neurological injuries. The most effective rules and techniques will be geared towards eliminating the use of the head for contact. Coaches, leagues and officials should take a zero tolerance policy towards this practice. Eliminating head first contact will not only minimize concussive episodes, it will minimize other more severe injuries, including spinal cord injuries.

I believe the most effective, and completely unrecognized, effort would penalize ball carriers for lowering their head. It is actually quite easy for an official to see ball carriers doing this, and I believe this technique is responsible for a majority of head to head collisions. Ball carriers with lowered heads incentivize tacklers to do the same, resulting in mutually dangerous activity. A ball carrier with his head up would actually reduce the incentive of the defender to use his head, and make doing so much more apparent to officials. The result would be a significant decline in head to head collisions.

Most commentary on head to head hits focuses on defenders. As a former defensive end at the youth level, and as a free safety at the high school level, I certainly led with my head all the time. I have now learned that it is entirely possible, and preferable, to tackle without using one's head. Xenith sponsors a very effective tackle training technique, coached by Bobby Hosea, called "Dip n' Rip". This technique has players deliver an upward thrust, with contact made across the chest and shoulders. This technique drives the runner upright, while the head remains out of the impact. Players make sound tackles with the focus on stopping forward progress.

A particularly vulnerable group is receivers. The NFL has begun to flag defenders for impacts to the head or neck of a "defenseless" receiver. I believe this situation would be further improved by requiring that defenders make a sincere effort to play the ball rather than the man while the ball is in the air. This would eliminate the many "blow up" hits delivered on receivers.

The defender's first purpose is to create an incomplete pass, and he should be required to make that effort. Once the ball is caught, there should be a sound tackling technique applied. Yes, there will be some gray area on this regarding the timing of tackles, but the intent is a **zero tolerance policy** for neurological injuries. Some may argue that this takes the toughness out of football. What is so tough about hitting someone in the head when they are not looking?

Linemen may experience a head to head hit every play. The practice of starting linemen upright, as opposed to starting in a down stance, is gaining momentum. It is difficult for some to conceive how a lineman can be effective without using his head, but once you ask the question, "how would you play if you weren't wearing a helmet?" the answer becomes evident. Blocking should occur with the arms and hands, not the head.

Players may continue to grow bigger, faster, and stronger, which contributes to the energy of collisions. Perhaps limits on Body Mass Index should be considered, but a total commitment must be made to eliminating the head as a primary point of contact. Anyone in the player's sphere of influence can be effective in reducing this practice.

REDUCE EXPOSURES

One of the factors that must be addressed is the number of exposures that athletes are subjected to. An exposure is an activity that subjects the athlete to potential for injury. This may be a practice, a game, or an extended drill. Simply put, the more you play, the more exposures you have. Extended seasons, double or triple sessions, spring practices, or long practices with "live" contact will increase the player's risk of injury. Teams would greatly improve safety by considering the number of exposures players are subjected to. This would of course reduce the risk of all other injuries as well.

IMPROVE PROTECTIVE EQUIPMENT

Protective equipment receives a tremendous amount of attention, both positive and negative, with regard to injury prevention. Some may blindly look for technology solutions, perhaps only after the problem has reached significant magnitude, at which point it is likely too late. Others believe that protective equipment cannot help, or they perceive that protective equipment leads players to take more risks, thereby making the problem worse. In reality, protective equipment can play an important role when applied in the proper context.

To understand the role of protective equipment, it is important to understand the mechanism of a concussive episode. The human brain has often been described as "jello-like," but I prefer describing it as a "balloon full of spaghetti." Of course, the spaghetti is actually countless nerve cells organized in an intricate pattern, orchestrating a complex array of functions, while suspended within the human skull.

The brain's function is disrupted by a sudden movement of the skull, which causes movement of the brain inside. The brain may slam into the skull, but it does not necessarily do this in a concussive episode. The key factor is sudden movement. Gradual movement is fine; sudden movement is not. Most of the time this sudden movement results from a direct contact to the head, but the brain can be injured by sudden movement even without direct contact to the head.

All things being equal, more sudden movement is more dangerous. Sudden change causes high force. Gradual change causes low force. Physics equations prove this. One can imagine that suddenly moving a balloon full of spaghetti will cause the spaghetti to be stretched, twisted, or damaged. In the actual brain, the effects of this movement and the disruption to nerve cells can vary widely between individuals. The outcome may be a spectrum of signs (visible to an observer) or symptoms (experienced by the individual) that will vary in duration and severity.

Therefore, protective equipment that minimizes the sudden movement of the head will reduce the risk of brain injury. The human body functions within very narrow ranges of tolerance. Small changes mean a lot. The difference between functional cartilage and a healthy knee joint versus dysfunctional cartilage and an unhealthy knee joint is millimeters and milliseconds of adaptive compressive ability in the cartilage. Protective equipment that alters the movement profile of the head, even by millimeters or milliseconds, will make a difference.

However, no responsible equipment manufacturer believes that equipment alone can completely solve the problem of concussive episodes. No responsible equipment manufacturer wants their equipment to create a false sense of security. No responsible equipment manufacturer wants their equipment used as a weapon. However, better equipment is clearly a piece of the risk reduction strategy.

IMPROVE RECOGNITION

Even in the best of circumstances, it is logical to expect that injuries will inevitably occur as a result of accidental circumstances. Arguably the biggest problem in football is "playing through" a concussive episode; this is an extreme thing to do, and dramatically increases the risk of further injury and increased disability. This is a result of the gladiator mentality, which mandates playing through pain.

Playing through an ankle sprain is understandable, but this mentality has been carried too far with regard to concussive episodes. Nerve cells do not heal the way other body tissues heal. In short, no one's brain is "tough". Players may come forward to reveal symptoms of a concussive episode, but it remains likely that players will work to stay on the field. It will be up to those around the players to recognize and report injuries.

Certified athletic trainers are often closest to players regarding physical injuries, and are therefore in a logical position to spot concussive episodes, or elicit honest information from players. Efforts to increase or mandate the presence of athletic trainers are certainly likely to result in better injury recognition.

In the absence of certified athletic trainers, coaches, officials, parents, and players still have a role. One concept, promoted by Dr. Gerry Gioia of Children's National Medical Center, is called "Carry the Clipboard." The Centers for Disease Control (CDC) offers free materials, designed to attach to a clipboard, providing a helpful checklist for awareness and management of concussive episodes. Carry the Clipboard suggests that one adult at each sporting event be assigned to carry the CDC information on a clipboard, designating that adult as responsible for recognizing players who appear to be debilitated, and for contacting a local expert.

Even though players may attempt to conceal their own symptoms, their teammates may be valuable partners in reporting a concussive episode. This unique form of honor code creates a team approach to risk reduction. Parents being attuned to their child's behaviors may be the most critical element.

A major cultural shift is underway, which should lead to increased recognition of concussive episodes. As the veil is lifted on this injury, a significant short term increase in diagnoses may result. Over time, a corresponding decrease in actual injury risk and diagnoses should occur.

IMPROVE MANAGEMENT AND RETURN TO PLAY

Once an injury is experienced, proper management under the care of an expert (or someone closely aligned with an expert) is imperative. Improper management, or no management, dramatically increases the chances for repeated injury, prolonged dysfunction, progressive disease, or fatality.

Modern standard of care for a concussive episode involves not just physical, but also mental rest. The metabolic dysfunction incurred during a concussive episode requires the brain to recalibrate itself, and physical or mental exertion may exacerbate symptoms during the period of recovery. Managed return to play involves resolution of symptoms, followed by progressively increasing activity over a period of time. There is no set time table; each individual will vary.

One increasingly utilized tool is neuropsychological testing. This type of testing involves athletes performing a series of tests, in order to gauge their "baseline" level of cognitive function. These tests are then repeated after the injury and during the period of recovery. Some mistakenly perceive these tests as pass/fail. In reality, these tests are part of the overall management plan, and when utilized properly, will contribute to the overall clinical picture.

With an athlete claiming no symptoms, performing well on neuropsychological testing helps confirm that the athlete is recovering well. Performing poorly indicates that the athlete is not yet recovered, or may be attempting to hide symptoms in an effort to return to play. Engaging in these tests also increases the likelihood that the athlete is managed by an expert, or managed by someone with access to experts.

Return to play decisions are rarely clear cut, but the science is evolving rapidly, and conservative management is always warranted. A great rule of thumb is "when in doubt, sit them out." Sometimes, someone needs to step forward to remove all doubt. After the concussive episode that sent me to the hospital, my mother simply declared that I was done playing for the season, case closed. I wasn't happy about it, but there was no debate. This was early in the 1985 season, and I was in seventh grade. Few knew anything about managing concussive episodes, and the advice of the ER was the routine three days off and I'd be fine. Knowing what we know now, it was the best thing she could have done for me, proving that parental instincts can play an important role in addressing this issue.

MANDATES

The epidemic of concussive episodes is a major public health issue. A role for legislation or mandates clearly exists. Several states have passed or are considering measures that require players to receive medical clearance before returning after a diagnosed concussion. This is a step in the right direction, but is relevant after the fact, and assumes a diagnosis was actually made; it is aimed at secondary prevention, and is not going to affect the vast majority of the injuries that go undiagnosed.

Primary prevention, the goal of preventing an injury from ever occurring, must be paramount. Legislation by the government, or mandates by institutions, aimed at educating anyone involved in overseeing athletic activities and minimizing exposures, would prevent countless injuries. If a youth football coach knew the dangers of concussive episodes, and was compelled to think about the practices he ran, the techniques he taught, and the behavior he rewarded, primary prevention would be a reality, and the gladiator mentality would die out. The enlightened warrior would be born.

CONCLUSION

Concussive episodes in football have reached epidemic proportion, and a complete risk reduction strategy must be built. Football has evolved over decades into something it was not intended to be, and the sport is often played in an extreme way. The extreme form of football must be eliminated, so the benefits of the game, including teamwork, selflessness, overcoming adversity, and achieving goals, can be maximized.

After finishing double sessions or an early morning training session, everything else in life feels much easier. Coming from behind for a last second victory really does make you feel like anything is possible. Helping an opposing player up from the ground after you've tackled him is an excellent guide for how to compete in life. The game of football will become even more popular, and will influence other sports for the better. It is time for some enlightenment.

ABOUT THE AUTHOR

Vin Ferrara is the Founder and CEO of Xenith, LLC, a company devoted to advancing safety and activity through innovation and education. Vin is a former Harvard University quarterback, who earned medical and business degrees from Columbia University before founding Xenith.

Mr. CONYERS. Dr. Ann McKee has a lot of experience, medical experience. She was Assistant Professor of Nuclear Pathology at Harvard Medical School, and then became Associate Professor of Neurology at Boston University School of Medicine, has served as the Director of the Neuropathology Corps of Boston University. She has conducted groundbreaking research on CTE. She is the chief neuropathologist at Framingham Heart Study. She also has the same title for the Boston-based Veterans Administration Medical

Centers and for the Sports Legacy Institute. And we are so pleased that you could join us this afternoon.

TESTIMONY OF ANN C. McKEE, M.D., ASSOCIATE PROFESSOR, NEUROLOGY AND PATHOLOGY, BOSTON UNIVERSITY SCHOOL OF MEDICINE

Dr. MCKEE. Well, thank you, Mr. Chairman and Members of the Committee. It is a pleasure to be here. And I am glad to speak on an issue that I think is extremely important.

My name is Dr. Ann McKee, and I am an Associate Professor of Neurology and Pathology at Boston University Medical School. I received my medical degree in 1979, and I am board certified in both neurology and neuropathology.

I come at this issue with a slightly different perspective. I examine the brains of individuals after death. And for the past 23 years, I have examined the brains of thousands of people, brains from people from all walks of life, and from individuals who lived to be well over the age of 100.

Through Chris Nowinski's efforts in early 2008, I had my first opportunity to examine the brain of a retired professional football player. It was the brain of John Grimsley, a former linebacker for the Houston Oilers, who had died of an accidental gunshot wound while cleaning his gun at the age of 45. According to his wife, he was concussed three times during his college career and eight times during his NFL career.

John began showing changes in his behavior and cognitive decline at the age of 40. He developed difficulties in short-term memory, attention, concentration, organization, planning, problem solving, judgment, and ability to juggle more than one task at a time. He would ask the same questions repeatedly over the course of the day, and would ask to rent a movie that he had already seen. He had trouble assembling his tax records, shopping alone, and understanding television. He developed a shorter and shorter fuse, and would become angry and verbally aggressive over seemingly trivial issues.

When I looked at his brain on postmortem examination, I found a massive buildup of tau protein as neurofibrillary tangles. The neurofibrillary tangles were distributed in a unique pattern, a pattern not found in any other neurodegenerative condition except chronic traumatic encephalopathy, or CTE. In CTE, tau protein builds up in the individual nerve cells, preventing them from making normal connections with other nerve cells, and eventually killing the cells. In this man's brain there were massive numbers of NFTs, so many that you could see the abnormalities on the glass slides without the use of a microscope, as you can see in the middle panels of the figure that is being presented. There is tremendous accumulation of tau protein that appears as a brown pigment. All the brown pigment you see is abnormal. And please compare what you see in the middle panel, John Grimsley's brain, to the brain of a normal man on the left, where you see absolutely no brown pigment.

All these slides are prepared and stained in the identical way and there is no brown pigment visible in the normal individual, whereas the brain of this 45-year-old husband and father at the

prime of his life showed profound changes of CTE. In John's brain, there were striking changes in regions of the brain that controlled personality and behavior, such as the frontal lobes. There were extreme changes in areas controlling rage behavior and impulsivity, such as the amygdala. And there were severe changes in areas that are also responsible for memory, such as the hippocampus.

I remind that you in a normal 45-year-old, absolutely none of these changes would be found. In fact, you wouldn't find these changes in a normal 65-year-old, 85-year-old, or 110-year-old.

The next five brains that I examined from former NFL football players all showed the same distinctive changes of chronic traumatic encephalopathy, including the brain of Thomas McHale, a former Tampa Bay Buccaneer.

The seventh brain of a former NFL player I analyzed was that of Louis Creekmur, a former offensive lineman for the Detroit Lions and an eight-time Pro Bowler. Louis Creekmur played 10 seasons for the Lions and was famous for suffering at least 13 broken noses and 16 concussions. Beginning at the age of 58, he began to show increasing cognitive and behavioral difficulties that included memory loss, problems with attention and organization, and outbursts of anger and aggression.

Mr. Creekmur was a member of the NFL's Plan 88. He died from complications of dementia at the age of 82. The brain of Mr. Creekmur showed extensive damage. There were widespread NFTs throughout his brain in the unique pattern that is found in CTE. There was no evidence of Alzheimer's disease or any other neurodegenerative disorder. The findings indicated that if Mr. Creekmur had not sustained repetitive head trauma during the play of football, he would be alive and well today enjoying his family and grandchildren.

I also have examined the brain of a high school player who suffered several concussions and died at the age of 18. Now, the brain from an 18-year-old man should be perfect. There should be no abnormalities anywhere. But in the brain of this young man at the age of 18, there were already spots of extreme damage and you could see the areas of damage, looking at the slides again, just with your naked eye as you see in the top panel in the red boxes. Those are areas of extreme damage found in an 18-year-old high school football player.

These are changes—the earliest changes of CTE, had he lived longer he certainly would have developed the same full blown CTE we have found in college and professional football players.

I have now examined the brains of seven former NFL players and four college players, and I have found the profound changes of CTE in all of them. I have also found the earliest changes of CTE in a high school football player.

I realize this is only a handful of cases. So what can you say about that? What can you say about only 11 cases? Well, what I can say is for the past 23 years I have looked at literally thousands of brains, from individuals of all walks of life, of all ages, and I have only seen this unique pattern of change with this severity in individuals with a history of repetitive head trauma, and that has included football as well as boxing.

None of my colleagues has ever seen a case of CTE without a history of head trauma, and there has been no documented case of CTE in the medical literature that did not occur without head trauma. The changes that we have seen today are dramatically not normal. There is no way that these pathologic changes represent a variation in normal that we would find under a bell-shaped curve. We have found these changes in every professional football player's brain that has come into the CSTE laboratory, and I have never seen this elsewhere in 20-plus years of examining brains. I have had colleagues of mine from other institutions, including leading pathologists from Harvard and Mount Sinai, independently examine these brains and they have come up with the same diagnosis, which is CTE.

I know that the argument is often made that there are hundreds of thousands of former football players, including professional players, that have no signs of cognitive decline or memory loss or personality change. But what I don't understand is why we are expecting that exposure to repetitive head trauma will cause disease in 100 percent of the individuals that suffer this trauma. Do we expect 100 percent of cigarette smokers to develop lung cancer? Do we expect 100 percent of children who play with matches or even with chainsaws to get hurt. No. Even if the percentage of affected individuals is 20 percent, or 10 percent or 5 percent, there are still thousands of kids and adults out there right now playing football at all levels who will eventually come down with this devastating and debilitating disorder. And as a doctor and as a mother, I think this calls for immediate action. We need to take radical steps to change the way football is played and we need to change this today.

[The prepared statement of Dr. McKee follows:]

PREPARED STATEMENT OF ANN C. MCKEE

Written Testimony

Ann C. McKee, M.D.

Associate Professor of Neurology and Pathology

Boston University School of Medicine

Director of the VISN-1 Neuropathology Laboratory for the New England Veterans Administration Medical Centers

Director of the Brain Banks for the Boston University Alzheimer's Disease Center, Framingham Heart Study, and Centenarian Study

Co-Director, Center for the Study of Traumatic Encephalopathy

Hearing before the House Judiciary Committee

Legal Issues Relating to Football Head Injuries

October 28, 2009

Mr. Chairman and Members of the Committee:

Thank you for the invitation to testify today on legal issues relating to football head injuries. My name is Dr. Ann McKee. I am an associate professor of Neurology and Pathology at Boston University School of Medicine, and I am the Director of the Neuropathology Laboratory for the New England Veterans Administration Medical Centers at the Bedford VA Medical Center, the Director of the Brain Banks for the Boston University Alzheimer's Disease Center, the Framingham Heart Study, and the Centenarian Study, and I am a co-director for the Center for the Study of Traumatic Encephalopathy at Boston University.

I received my medical degree in 1979, and I am board certified in both Neurology and Neuropathology. I have extensive experience in neuropathology of neurological disease and have written extensively on the neuropathology of many neurodegenerative diseases, including Alzheimer's disease, Parkinson's disease, and Frontotemporal Dementia, as well as normal aging. For the past 23 years, I have been studying the brains of individuals after death and correlating the pathological findings to the patient's clinical symptoms during life. I have examined thousands of brains, brains from people in all walks of life including brains from individuals who have lived to be well over the age of 100. In addition, for most of my professional career, I have been focused on *tau* protein, a protein that becomes toxic when abnormally phosphorylated and builds up in the brains of patients with some neurodegenerative diseases, including Alzheimer's disease, but is found only in very limited quantities in the brains of normally functioning people.

In January of 2003, as part of my work with the Boston University Alzheimer's Disease Center and the Bedford VA, I examined the brain of a man who died at the age of 72

after 15 years of severe dementia requiring institutionalization. The man had been a world champion boxer and had been clinically diagnosed with Alzheimer's disease beginning at the age of 58. However, when I looked at his brain on post-mortem examination, I found that there was absolutely no evidence of Alzheimer's disease; there was no evidence of *beta amyloid*, a protein that accumulates in the brain in people with Alzheimer's disease and is thought by many to be the cause of Alzheimer's disease. Instead, the brain of this world champion boxer showed a massive build-up of the toxic form of tau protein as neurofibrillary tangles (NFTs) and glial tangles throughout his brain. The neurofibrillary and glial tangles were also distributed in a unique pattern, a pattern not found in any neurodegenerative condition except Chronic Traumatic Encephalopathy, or CTE. In CTE, tau protein builds up in individual nerve cells and prevents them from making normal connections with other nerve cells, eventually killing the cells. In this man's brain, there were massive numbers of NFTs and glial tangles, so many in fact that you could see the abnormalities on the glass slides without the use of a microscope, as you can see in the right panels of Figure 1. There is tremendous accumulation of tau protein that appears as a brown pigment. All the brown pigment you see is abnormal, please compare what you see on the right to the brain of a normal 65 year old man on the left, all the slides are prepared and stained in exactly the same way, and there is absolutely no brown pigment visible in the normal individual. When you look at the brain microscopically as in the lower panels, you can see that many individual nerve cells of the boxer contain NFTs – they are found in nearly every nerve cell and there are almost no normal appearing cells. This individual, a former professional boxer, was clinically diagnosed with Alzheimer's disease during life, but the disease that actually caused his tragic 15 year decline in intellect and eventually killed him, was CTE, a disorder that would have been entirely prevented if he hadn't suffered repeated head injury in his younger years as a boxer.

My second case of CTE came in 2004, again when I was examining the brain of a man who had been clinically diagnosed with Alzheimer's disease when he was alive. When I looked at the slides, I immediately realized that the changes found in this individual were nearly identical to those that I had found in the world champion boxer, but in this case, the medical records did not indicate that he had ever had any head injury. So I called the patient's daughter, and sure enough, it turned out that the man had been a professional boxer during his twenties. Again, his post-mortem examination indicated that his functional deterioration, dementia and placement in a nursing home were not due to Alzheimer's disease, but instead due to CTE, a disorder that could have been entirely prevented. Over the ensuing years, I examined several other cases of CTE in professional boxers, all with a similar appearance and pattern of abnormalities.

I met Chris Nowinski in the summer of 2007 and through Chris's efforts in early 2008, I had my first opportunity to examine the brain of a retired professional football player. It was the brain of John Grimsley, a former linebacker for the Houston Oilers who had died of an accidental gunshot wound while cleaning his gun at the age of 45. According to his wife, he was concussed 3 times during his college football years, and at least 8 times during his NFL career, however, only one "cerebral concussion" was medically confirmed. He was never formally diagnosed with post-concussion syndrome and never sought medical attention for residual cognitive and behavioral difficulties. There was no history of ever losing consciousness for more than a few seconds and he never required being carried off the field or hospitalization. He never took any performance-enhancing drugs or used illicit drugs. He was a nonsmoker and there was no known family history of dementia.

According to his wife and close friends, he began showing changes in his behavior and cognitive decline at age 40. He developed difficulties in short-term memory, attention, concentration, organization, planning, problem-solving, judgment, and the ability to juggle more than one task at a time. For example, he would ask the same questions repeatedly over the course of the day and he would ask to rent a movie that he had already seen. He had difficulty assembling his tax records, shopping alone, and understanding television. His symptoms gradually progressed and became quite severe by the end of his life. He also developed a "shorter and shorter fuse" and would become angry and verbally aggressive over seemingly trivial issues.

When I first looked at his brain (it had been previously dissected by the coroner), I didn't see any gross changes. Yet when the microscopic slides were prepared, they showed the exact same pattern of changes that I had found in the brains of the boxers with CTE. There were large numbers of tau containing neurofibrillary tangles throughout all parts of the brain and there was absolutely no evidence of beta amyloid protein or Alzheimer's disease. The brain of this 45 year old husband and father, at the prime of his life, showed profound neurofibrillary degeneration, changes of CTE that were identical in nature to the changes I found in the brains of the boxers, but were now in a football linebacker some 30 years younger. In John Grimsley's brain, there were striking changes in regions of the brain controlling personality and behavior, such as the frontal lobes, profound changes in the areas controlling impulsivity and rage behavior such as the amygdala, and severe changes in anatomic structures that are responsible for memory, such as the hippocampus, mammillary bodies and thalamus. In Figure 1, the brain of John Grimsley is seen in the middle; in the top middle panel, you can see severe

tau deposition in the frontal lobe and microscopically; in the bottom middle panel, you can see numerous nerve cells containing tau and NFTs.

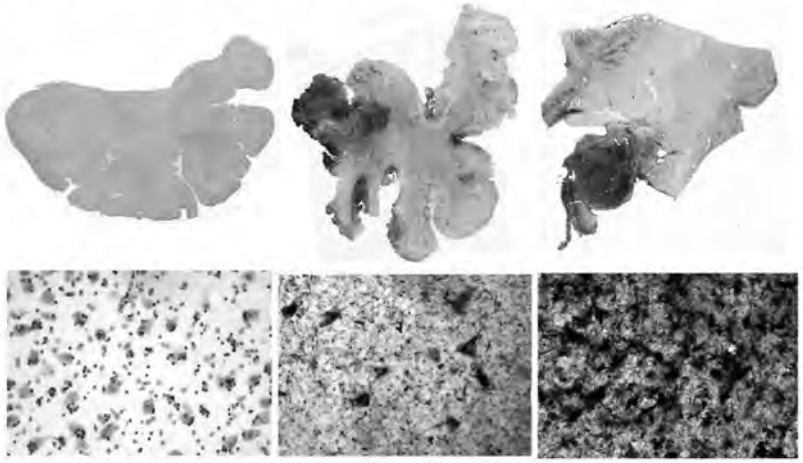

Figure 1

In a normal 45 year old, absolutely none of these changes would be found. Indeed these changes would not be found in a normal 65 year old, 85 year old or 110 year old.

The next football player's brain that I examined was that of Tom McHale, a 45 year old retired offensive lineman for the Tampa Bay Buccaneers. He was a husband and father of 3 young boys. After a 3 year decline in his ability to make sound business decisions, increasing apathy, depression, and memory loss, he died as a result of substance abuse. His wife did not know of any reported formal concussions during his year as a lineman. His brain too showed profound tau immunoreactive neurofibrillary degeneration in areas controlling memory, impulsivity, organization and problem solving (as you can see in Figure 2) and again with no evidence of any other disorder other than CTE.

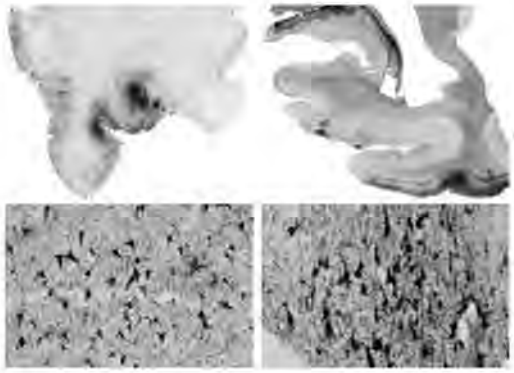

Figure 2

The third brain of a professional football player I examined was that of Wally Hilgenberg, a 66 year old former linebacker who died from complications related to Amyotrophic Lateral sclerosis or Lou Gehrigs disease. He played 16 seasons with the Minnesota Vikings and had at least 10 concussions, including losing consciousness on 1 or 2 occasions. He began showing slow and steady cognitive decline at the age of 56. His cognitive difficulties were manifest mainly by "not understanding things at a deeper level" and he had difficulties with executive functioning, including worsening organization and

planning skills. His cognitive decline progressed with worsening memory and language functions. In his last year, he stopped being able to read and was completely unable to learn how to operate an assistive communication device, even using the simplest level of commands. Inspection of his brain showed damage to the frontal cortex in a pattern that suggested it had been used as a battering ram, and the interior spinal fluid spaces were enlarged suggesting that the volume of the brain had declined. Microscopically the brain was densely riddled by tau containing NFTs and glial tangles throughout the cerebral cortex, basal ganglia, thalamus, and brainstem in the unique pattern that defines CTE, and again, in the complete absence of Alzheimer's disease and beta amyloid. Furthermore, the damage found in his brain was far greater in density and the damage was much more widespread than anything that I have ever found in Alzheimer's disease or any of the other common neurodegenerative disorders.

Figure 3

The fourth, fifth and sixth brains from former NFL football players that I examined, including one individual who took his own life, all showed the same distinctive, characteristic changes of CTE. The seventh brain of a former NFL player I analyzed was that of Louis Creekmur, a former offensive lineman for the Detroit Lions and an eight-time Pro Bowler. Louis Creekmur played ten seasons for the Lions, and was famous for suffering at least thirteen broken noses and 16 concussions. Beginning at the age of 58, he began to show increasing cognitive and behavioral difficulties including memory loss, problems with attention and organization, and outbursts of anger and aggression. He died from complications of dementia at the age of 82. The brain of Mr. Creekmur showed extensive damage including marked shrinkage of medial temporal lobe structures that control memory, shrinkage of the frontal and temporal lobes, and marked dilation of the spinal fluid cavities that line the brain's interior. There was widespread and severe tau deposition as NFTs throughout the frontal and temporal lobes, amygdala, hippocampus, thalamus and brainstem in the unique pattern that is only found in CTE. In Mr. Creekmur's case, the abnormalities were profound, they were severe, and they paralleled the changes found in the world champion professional boxer. Mr. Creekmur was also a member the NFL's Plan 88. Yet again, there was absolutely no evidence of Alzheimer's disease or any other neurodegenerative disorder, and the findings indicated that if Mr. Creekmur had not sustained repetitive head trauma during the play of football, he would be alive and well and enjoying his family and grandchildren today.

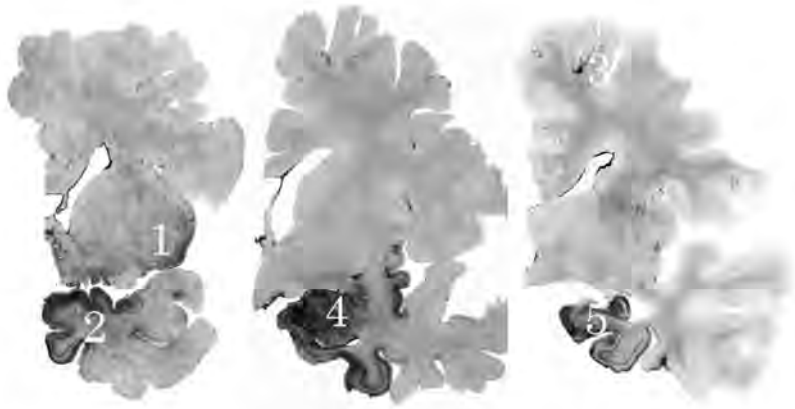

Figure 4

I have also examined the brain of a former college football player, Mike Borich, a former wide receiver for Snow College and Western Illinois University who died at the age of 42 after a several-year period of increasing irritability, aggressive and violent outbursts, and drug and alcohol abuse. His brain, too, showed CTE affecting widespread parts of his cerebral cortex and deep brain nuclei. Brains from 3 other college football players showed similar changes.

Lastly, I have had the opportunity to examine the brain of a high school football player who died at the age of 18. He had played football and other sports for 4 years and suffered several concussions. The brain of an 18 year old should be pristine, there should be no abnormalities anywhere, no abnormalities whatsoever. But in the brain of this young man, a brain that should be entirely normal, there were spots of undeniable pathology. They were 4 areas of damage in the frontal lobe that you could see even looking at the slides with your naked eye (Figure 5). In those areas, there were hundreds of degenerating nerve cells containing tau neurofibrillary tangles and disordered nerve

cell processes. Even in this 18 year old high school student, with only a few years experience playing football, there were signs of the earliest stages of CTE. Had he lived longer, this 18 year old would have almost certainly developed the same full blown CTE that we found in the other college and professional football players.

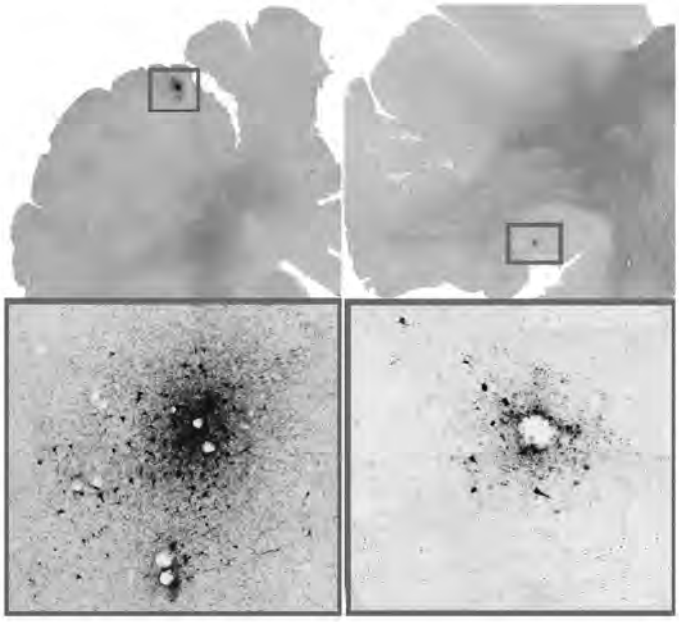

Figure 5

I have now examined the brains of 7 former NFL players, and 4 college layers, and all 11 have shown profound and widespread changes of CTE. I have also found CTE in a college level player and the earliest signs of CTE in a high school football player. I realize that this is just a handful of cases, so – so what? -what can you say from just 11 cases? Well, I can say that for the past 23 years, I have looked at thousands of brains, from individuals from all walks of life, of all ages, and during the past 20 years, I have primarily focused on abnormalities of tau protein. But I have only seen this unique

pattern of changes, in this severity, in individuals with a history of repetitive head trauma, including boxers and football players. These changes are dramatically *not normal* -there is no way these pathological changes represent a variation in normal that we find under a bell shaped curve. We have found these changes in every professional football players' brain that has come into my laboratory at the BU Center for the Study of Traumatic Encephalopathy and I have never seen this in 20 plus years of examining brains. I have had colleagues of mine from other institutions – leading neuropathologists from Harvard and Mt. Sinai—independently examine these brains, and they have come up with the same diagnosis as I had, CTE. I know that the argument is often made that there are hundreds of thousands of former football players, including former professional football players, with no signs of any cognitive decline or memory loss or personality change, but what I don't understand is why are we expecting that this exposure to repetitive head trauma will have 100% penetrance into the population and cause disease in every football player? Do we expect 100% of cigarette smokers will develop lung cancer? Do we expect 100% of children who play with matches or even chain saws will get hurt? No. Even if the percentage of affected players is 20%, or 10%, there are still thousands of kids and adults out there, right now, *playing football at all levels* -who will eventually come down with this devastating and debilitating disorder. And as a doctor and as a mother, I think this calls for immediate action. We need to take radical steps to change the way football is played and we need to make those changes today.

B.U. Center for the Study of Traumatic Encephalopathy Grant Support

Title: Development of Pathology Diagnostic Criteria for Chronic Traumatic Encephalopathy

Co-Principal Investigators: Ann McKee and Robert Stern

Type of Grant: Supplement to P30 Center Grant (N. Kowell, P.I); P30-AG13846

Funding Agency: National Institute on Aging

Years Funded: 2009-2010

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Title: Neuropathologic Examination of Traumatic Encephalopathy in Athletes with Histories of Repetitive Concussion

Co-Principal Investigators: Ann McKee and Robert Stern

Type of Grant: Supplement to P30 Center Grant (N. Kowell, P.I); P30-AG13846

Funding Agency: National Institute on Aging

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Total Direct Costs: $100,000

Mr. CONYERS. Thank you so much for your testimony.
Dr. MCKEE. Thank you. And I just want to introduce also a paper that we have written for your consideration.
Mr. CONYERS. We will accept it into the record.
[The information referred to follows:]

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REVIEW ARTICLE

Chronic Traumatic Encephalopathy in Athletes: Progressive Tauopathy After Repetitive Head Injury

Ann C. McKee, MD, Robert C. Cantu, MD, Christopher J. Nowinski, AB, E. Tessa Hedley-Whyte, MD, Brandon E. Gavett, PhD, Andrew E. Budson, MD, Veronica E. Santini, MD, Hyo-Soon Lee, MD, Caroline A. Kubilus, and Robert A. Stern, PhD

Abstract

Since the 1920s, it has been known that the repetitive brain trauma associated with boxing may produce a progressive neurological deterioration, originally termed *dementia pugilistica*, and more recently, *chronic traumatic encephalopathy* (CTE). We review 48 cases of neuropathologically verified CTE recorded in the literature and document the detailed findings of CTE in 3 professional athletes, 1 football player and 2 boxers. Clinically, CTE is associated with memory disturbances, behavioral and personality changes, parkinsonism, and speech and gait abnormalities. Neuropathologically, CTE is characterized by atrophy of the cerebral hemispheres, medial temporal lobe, thalamus, mammillary bodies, and brainstem, with ventricular dilatation and a fenestrated cavum septum pellucidum. Microscopically, there are extensive tau-immunoreactive neurofibrillary tangles, astrocytic tangles, and spindle-shaped and threadlike neurites throughout the brain. The neurofibrillary degeneration of CTE is distinguished from other tauopathies by preferential involvement of the superficial cortical layers, irregular patchy distribution in the frontal and temporal cortices, propensity for sulcal depths, prominent perivascular, periventricular, and subpial distribution, and marked accumulation of tau-immunoreactive astrocytes. Deposition of β-amyloid, most commonly as diffuse plaques, occurs in fewer than half the cases. Chronic traumatic encephalopathy is a neuropathologically distinct slowly progressive tauopathy with a clear environmental etiology.

Key Words: Athletes, Concussion, Dementia, Encephalopathy, Neurodegeneration, Tau protein, Traumatic brain injury.

From the Departments of Neurology (ACM, BEG, AEB, VES, H-SL, CAK, RAS) and Pathology (ACM), Center for the Study of Traumatic Encephalopathy (ACM, RCC, CJN, RAS), Boston University School ofMedicine, Boston; Geriatric Research Education Clinical Center, Bedford Veterans Administration Medical Center, Bedford (ACM, AEB); Sports Legacy Institute, Waltham (RCC, CJN); Department of Neurosurgery, Boston University School of Medicine, Boston (RCC); Department of Neurosurgery, Emerson Hospital, Concord (RCC); and CS Kubik Laboratory for Neuropathology, Department of Pathology, Massachusetts General Hospital, Harvard Medical School, Boston (ETH-W), Massachusetts.

Send correspondence and reprint requests to: Ann C. McKee, MD, Bedford Veterans Administration Medical Center, 200 Springs Rd 182-B, Bedford, MA 01730; E-mail: amckee@bu.edu

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INTRODUCTION

During recent years, there has been increasing attention focused on the neurological sequelae of sports-related traumatic brain injury (TBI), particularly concussion. Concussion is a frequent occurrence in contact sports: 1.6 to 3.8 million sports-related concussions occur annually in the United States (1–3). Most sports-related head injury is minor, and although most athletes who have a concussion recover within a few days or weeks, a small number of individuals develop long-lasting or progressive symptoms. This is especially true in cases of repetitive concussion or mild TBI, in which at least 17% of individuals develop chronic traumatic encephalopathy (CTE) (4). The precise incidence of CTE after repetitive head injury is unknown, however, and it is likely much higher. It is also unclear what severity or recurrence of head injury is required to initiate CTE; no well-designed prospective studies have addressed these important public health issues (5–10).

Repetitive closed head injury occurs in a wide variety of contact sports, including football, boxing, wrestling, rugby, hockey, lacrosse, soccer, and skiing. Furthermore, in collision sports, such as football and boxing, players may experience thousands of subconcussive hits during the course of a single season (11, 12). Although the long-term neurological and neuropathologic sequelae associated with repetitive brain injury are best known in boxing, pathologically verified CTE has been reported in professional football players, a professional wrestler, and a soccer player, as well as in epileptics, head bangers, and domestic abuse victims (13–21). Other sports associated with a postconcussive syndrome include hockey, rugby, karate, horse riding, and parachuting (22–25), although the list is almost certainly more inclusive. Furthermore, additional large groups of individuals prone to repetitive head trauma, such as military veterans, may be at risk for CTE.

In this review, we present a summary of the 48 cases of neuropathologically verified CTE in the literature. We also report the clinical and immunocytochemical findings of CTE in 3 retired professional athletes, that is, 1 football player and 2 boxers, ranging in age from 45 to 80 years. Although the cases previously reported in the literature detailed some of the characteristic gross and histological features of CTE, the spectrum of unique regionally specific immunocytochemical abnormalities of phosphorylated tau

that occur in this disorder has not been previously described. We demonstrate that although CTE shares many features of other neurodegenerative disorders, including Alzheimer disease (AD), progressive supranuclear palsy (PSP), postencephalitic parkinsonism, and the amyotrophic lateral sclerosis/Parkinson-dementia complex of Guam (ALS/PDC), CTE is a neuropathologically distinct progressive tauopathy with a clear environmental etiology.

CLINICAL AND DEMOGRAPHIC FEATURES OF CTE

The concept of CTE was first introduced by Martland (26) in 1928, who introduced the term *punch-drunk* to a symptom complex that seemed to be the result of repeated sublethal blows to the head. This syndrome, long recognized in professional boxers, was termed *dementia pugilistica* by Millspaugh (27) and the *psychopathic deterioration of pugilists* by Courville (28). The symptoms of CTE are insidious, first manifested by deteriorations in attention, concentration, and memory, as well as disorientation and confusion, and occasionally accompanied by dizziness and headaches. With progressive deterioration, additional symptoms, such as lack of insight, poor judgment, and overt dementia, become manifest. Severe cases are accompanied by a progressive slowing of muscular movements, a staggered propulsive gait, masked facies, impeded speech, tremors, vertigo, and deafness (27). Corsellis et al (29) described 3 stages of clinical deterioration as follows. The first stage is characterized by affective disturbances and psychotic symptoms. Social instability, erratic behavior, memory loss, and initial symptoms of Parkinson disease appear during the second stage. The third stage consists of general cognitive dysfunction progressing to dementia and is often accompanied by full-blown parkinsonism, as well as speech and gait abnormalities. Other symptoms include dysarthria, dysphagia, and ocular abnormalities, such as ptosis (29). The severity of the disorder seems to correlate with the length of time engaged in the sport and the number of traumatic injuries, although whether a single TBI can trigger the onset of CTE remains a matter of speculation.

Of the 51 neuropathologically confirmed cases of CTE, 46 (90%) occurred in athletes. The athletes included 39 boxers (85%) who fought as amateurs and as professionals for varying lengths of time (range, 4–25 years; mean, 14.4 years), 5 football players (11%) whose playing time ranged between 14 and 23 years (mean, 18.4 years; SD, 3.9), 1 professional wrestler, and 1 soccer player. The athletes began their respective sports at young ages, that is, between 11 and 19 years (mean, 15.4 years; SD, 2.2) (Tables 1 and 2). The first symptoms of CTE were noticed at ages ranging from 25 to 76 years (mean, 42.8 years; SD, 12.7). One third were symptomatic at the time of their retirement from the sport, and half were symptomatic within 4 years of stopping play. Common presenting symptoms included memory loss, irritability, outbursts of aggressive or violent behavior, confusion, speech abnormalities, cognitive decline, gait abnormalities, unsteadiness, headaches, slurred speech, and parkinsonism. In 14 cases (30%), there was a prominent mood disturbance, usually depression (28%); 1 boxer was described as having a "euphoric dementia" (31); another boxer was described as manic-depressive (35); and a football player was considered "bipolar" (40). In most of the reported cases, the disease slowly progressed for several decades (range, 2–46 years; mean, 18.6 years; SD, 12.6), with increasing abnormalities in behavior and personality, memory loss, cognitive decline, and visuospatial difficulties. Movement abnormalities were eventually found in 41.2% subjects consisting of parkinsonism; staggered, slowed, or shuffled gait; slowed, slurred, or dysarthric speech; ataxia; ocular abnormalities; and dysphagia. As Critchley (42) noted in 1957, "once established, it not only does not permit reversibility, but ordinarily advances steadily, even though the boxer has retired from the ring."

CTE in Football Players

Five football players, including our Case 1, had neuropathologically verified CTE at autopsy. All died suddenly in middle age (age at death, 36–50 years; mean, 44.0 years; SD, 5.0) and were younger at the time of death compared with boxers with CTE (age at death, 23–91 years; mean, 60.0 years; SD, 15.2). The duration of symptomatic illness was also shorter in the football players (range, 3–10 years; mean, 6.0 years; SD, 2.9) compared with the boxers (range, 5–46 years; mean, 20.6 years; SD, 12.3). All 5 football players played similar positions: 3 were offensive linemen, one was a defensive lineman, and the other was a linebacker. In the football players, the most common symptoms were mood disorder (mainly depression), memory loss, paranoia, and poor insight or judgment (each found in 80%), outbursts of anger or aggression, irritability, and apathy (each found in 60%), confusion, reduced concentration, agitation, or hyperreligiosity (each found in 40%). Furthermore, 4 of the 5 experienced tragic deaths, that is, 2 from suicide (16, 17), one during a high-speed police chase (40), and another from an accidental gunshot while cleaning his gun (Case 1). Case 1 exemplifies these clinical features.

Case A

A 45-year-old right-handed white man died unexpectedly as a result of an accidental gunshot wound to the chest while he was cleaning a gun. He was a retired professional football player who played football in high school, 3 years of college, and 10 years in the National Football League as a linebacker. According to his wife, he was concussed 3 times during his college football years and at least 8 times during his National Football League career; however, only 1 concussion was medically confirmed. He was never formally diagnosed as having postconcussive syndrome and never sought medical attention for residual cognitive or behavioral difficulties. There was no history of ever losing consciousness for more than a few seconds, and he never required being carried off the field or hospitalization.

At age 40 years, his family began to notice minor impairments in his short-term memory, attention, concentration, organization, planning, problem solving, judgment, and ability to juggle more than one task at a time. His spatial abilities were mildly impaired, and his language was unaffected.

TABLE 1. Demographic Information

Case No.	Reference	Sex	Sport/Activity	Age Sport Begun, years	Years of Play	Age at Onset Symptoms, years	Interval Between Retirement and Symptoms, years	Interval Between Symptom Onset and Death, years	Age at Death, years	ApoE Genotype
1	30	M	Boxing	17	11	38	10	13	51	
2	31	M	Boxing	15	14	36	6	12	48	
3	32	M	Boxing	14	10	46	10	7	53	
4	32	M	Boxing	18	6	48	24	10	58	
5	28	M	Boxing		4				49	
6	33	M	Boxing							
7	33	M	Boxing							
8	34	M	Boxing	16	7	25	1	33	58	
9	35	M	Boxing	12	12	30	6			
10	35	M	Boxing	15	20	36	0	10	46	
11	35	M	Boxing	19	12	31	0	15	46	
12	35	M	Boxing	16	16	40	8	5	45	
13	35	M	Boxing	15	13	28	0	16	44	
14	35	M	Boxing	12	12		4		28	
15	29	M	Boxing	11	14	25	0	38	63	
16	29	M	Boxing		20	50	20	27	77	
17	29	M	Boxing	16	14	30	0	33	63	
18	29	M	Boxing	15	25	35	0	34	69	
19	29	M	Boxing	18	18	36	0	25	61	
20	29	M	Boxing	13	25	37	0	46	83	
21	29	M	Boxing	16	20	54	18	8	62	
22	29	M	Boxing	17	23	60	20	11	71	
23	29	M	Boxing		>10	31	0	41	72	
24	29	M	Boxing			40		27	67	
25	29	M	Boxing			48		19	67	
26	29	M	Boxing	14	16	43	4	14	57	
27	29	M	Boxing	18	10				61	
28	29	M	Boxing						91	
29	29	M	Boxing						58	
30	18	F	Physical abuse						76	
31	14	F	Autistic head banging						24	
32	36	M	Boxing		>25				63	
33	36	M	Boxing		>25				69	
34	19	M	Circus clown		15				33	
35	15	M	Boxing		>11	61	37	10	71	
36	13, 37	M	Boxing	11	12				23	ε3/ε4
37	13	M	Boxing	16	5		0		28	
38	13	M	Head banging						28	
39	13	M	Epilepsy						27	
40	13	M	Soccer						23	ε3/ε3
41	38	M	Boxing		10	64			67	ε3/ε4
42	39	M	Boxing			76			78	
43	17	M	Football	16	22				50	ε3/ε3
44	16	M	Football	18	14	35	2	10	45	ε3/ε3
45	21	M	Football	15	23	38	0	6	44	ε3/ε4
46	20	M	Wrestling	18	22	38	0	2	40	ε3/ε3
47	40	M	Football	16	17	36	3	3	36	
48	41	M	Boxing	16	17	58		13	61	ε3/ε3
49	Case 1	M	Football	16	16	40	9	5	45	ε4/ε4
50	Case 2	M	Boxing	17	5	63	33	17	80	ε3/ε4
51	Case 3	M	Boxing	11	22	58	25	15	73	ε3/ε3

F, female; M, male.

TABLE 2. Clinical Manifestations

Case No.	Initial Symptoms	I. Personality/Behavior Change	Dysphoria	Irritability	Confusion	Agitation	Paranoia
1	Memory, speech	x				x	
2	Euphoria, dementia	x	x				
3		x		x			x
4	Memory, confusion	x	x	x	x		
5	Memory, confusion	x			x		
6							
7							
8	Cognitive decline, hemiparesis	x	x	x	x		x
9	Manic-depressive psychosis	x	x				
10	Headaches	x	x		x		x
11	Headaches	x	x		x		
12	Slurred speech, gait change	x	x		x		
13	Punchy, unsteady						
14							
15	Violent outbursts	x		x			
16	Staggered gait, slowed speech	x		x	x		
17	Confusion, falls	x		x	x	x	x
18	Unsteadiness						
19	Irritability, memory loss, aggression	x		x			
20	Gait, speech	x					x
21	Dysphoria, violence	x			x		
22	Ataxia, falls, weakness				x		
23	Tremor, slurred speech	x					
24	Memory loss	x			x	x	x
25	Confusion	x			x		
26	Speech, delirium	x			x		x
27	None						
28	Aggression	x					
29	None						
30							
31							
32		x	x				
33		x	x				
34		x					
35							
36							
37	Paranoid schizophrenia						
38							
39							
40							
41	Cognitive decline, ALS-like syndrome	x		x	x	x	x
42	Cognitive decline, parkinsonism						
43	Memory, dysphoria	x	x				
44	Depression, erratic	x	x	x		x	x
45	Headaches, poor decisions	x	x				x
46	Depression, violent	x	x				
47	Bipolar disorder	x	x	x	x	x	x
48	Memory loss						
A*	Memory, confusion	x	x	x	x		x
B*	Disorientation, confusion	x		x	x	x	x
C*	Memory	x	x	x	x	x	x

*New Cases A, B, and C of this series.
x, clinical feature was noted as present; blank, clinical feature was not mentioned.
ALS, amyotrophic lateral sclerosis.

TABLE 2. *(Continued)*

Reduced Concentration	Aggression/ Violence	Poor Insight/ Judgment	Apathy	Hypersexuality	II. Somatic Symptoms	Headache	Dizziness	Insomnia
	x	x						
	x				x	x		
x	x				x	x		x
x	x				x	x		x
	x							
	x							
	x							
	x							
	x			x	x	x		
	x							
	x							
	x							
	x							
	x							
	x							
		x						
	x							
x	x	x						
		x						
x	x	x						
		x	x		x	x		
	x							
x	x	x	x					
x	x	x						
x	x	x						
x	x	x	x		x		x	

TABLE 2. *(Continued)*

Case No.	Deafness	Epilepsy	III. Cognitive Changes	Memory Loss	Dementia	Visuospatial Abnormalities	IV. Movement Abnormalities	Parkinsonism	Decreased Facial Movement
1			x	x	x		x	x	
2		x	x	x	x		x	x	
3			x	x			x		
4			x	x	x				
5			x						
6									
7									
8		x	x	x	x		x	x	x
9									
10									
11			x	x			x	x	
12			x	x					
13			x						
14							x	x	
15			x	x			x	x	
16			x	x	x		x		
17			x	x				x	x
18			x	x	x		x	x	
19			x	x					
20			x	x			x	x	
21			x	x	x		x		
22			x				x	x	
23			x	x	x		x	x	x
24			x	x	x				
25			x	x	x				
26			x	x	x		x	x	
27									
28									
29									
30									
31									
32			x	x			x	x	x
33			x	x			x	x	x
34			x	x	x				
35			x	x	x				
36									
37									
38									
39									
40									
41			x	x	x		x	x	x
42			x	x	x		x	x	
43			x	x	x		x	x	
44									
45			x	x					
46			x	x					
47			x	x	x				
48			x	x		x			
A*			x	x		x			
B*			x	x	x	x	x		
C*			x	x	x	x	x	x	x

TABLE 2. *(Continued)*

Slowed Movements	Tremor	Rigidity	Falls	Ocular Abnormalities	Ptosis	Reduced Upgaze	Gait Problems	Staggered
x								
	x			x		x	x	
							x	
			x					
x								
							x	
				x				
							x	
							x	x
							x	x
				x	x			
	x		x				x	x
	x	x	x				x	x
x							x	
							x	x
			x				x	
	x		x				x	
	x	x	x				x	
x								
	x						x	
	x						x	
							x	
							x	
			x				x	x
	x			x		x	x	

TABLE 2. *(Continued)*

Case No.	Slowed	Shuffled	Ataxia	Reduced Coordination	Speech Changes	Slowed	Slurred	Dysarthria	Dysphagia	Spasticity
1					x	x				
2			x							x
3			x							x
4										
5										
6					x					
7		x						x		x
8										
9			x		x		x	x		
10					x		x			
11				x	x	x				
12				x	x					
13										
14			x		x					
15			x		x	x	x			
16			x		x	x	x	x	x	x
17		x	x		x		x	x		x
18										
19	x	x	x		x		x	x		
20			x							
21			x		x					
22			x				x	x		
23										
24										
25					x	x	x			
26										
27										
28										
29										
30										
31					x			x		
32					x			x		
33			x							
34										
35										
36										
37										
38										
39										
40					x					x
41										
42										
43										
44										
45										
46										
47										
48										
A*					x		x			
B*					x		x			
C*	x	x			x		x			

He repeatedly asked the same questions over and over, he did not recall why he went to the store unless he had a list, and he would ask to rent a movie that he had already seen. These symptoms gradually increased and became pronounced by the end of his life 5 years later. Using a modification of the Family Version of the Cognitive Difficulties Scale (43, 44), he had a moderate amount of cognitive difficulties. On a modified AD8 informant interview for dementia, he received a total score of 4, which indicated "cognitive impairment is likely to be present" (45). By contrast, the Functional Activities Questionnaire (46), an informant-based measure of instrumental activities of daily living, did not indicate significant functional dependence despite his difficulty in assembling tax records, shopping alone, and understanding television (total Functional Activities Questionnaire score, 3). Moreover, he continued to perform his job as a hunting and fishing guide in a satisfactory manner.

Toward the end of his life, he tended to become angry and verbally aggressive over insignificant issues and was more emotionally labile. He also began to consume more alcohol but did not show other signs or symptoms of depression. He had no significant psychiatric history, and he had never taken performance-enhancing or illicit drugs. His family history was negative for dementia and psychiatric illness.

CTE in Boxers

Boxing is the most frequent sport associated with CTE, and disease duration is the longest in boxers, with case reports of individuals living for 33, 34, 38, 41, and 46 years with smoldering, yet symptomatic, disease (29). Boxers with long-standing CTE are frequently demented (46%) and may be misdiagnosed clinically as AD (47), as occurred in Cases 2 and 3.

Case B

An 80-year-old African American/American Indian man was first noted to have difficulty remembering things in his mid-20s. He began boxing when he was 17 years old, quickly rose to professional ranks, and fought professionally for 5 years until he retired at age 22 years. He had a mild head injury in his early teenaged years while moving farm equipment, although he did not lose consciousness or experience any permanent disability. By his mid-30s, he had brief occasional episodes of confusion and a tendency to fall. His wife attributed his occasional forgetfulness, falls, and confusion to being mildly "punch-drunk." His symptoms remained more or less stable during the following 4 decades except for an increased tendency to become disoriented when traveling to unfamiliar places. By age 70 years, he got lost driving on familiar roads; he became increasingly confused and disoriented and did not recognize his daughter. By age 78 years, he was paranoid, his memory loss had increased, his gait was unsteady, his speech slowed, and he frequently fell. He was easily agitated and required multiple hospitalizations for aggressive behaviors. He died at age 80 years of complications of septic shock.

He had a period of alcohol abuse as a young adult but was abstinent for the last 40 years of his life. He smoked cigarettes for 20 years. He was employed as a roofer for most of his life and was in excellent physical condition, running miles and doing daily calisthenics. He had no history of depression or anxiety and was generally pleasant and even-tempered. His family history was positive for a paternal grandfather with a history of cognitive decline and a brother with AD. Cerebral computerized axial tomography performed 2 and 3 years before death revealed progressive cerebral and cerebellar atrophy and mild ventricular enlargement.

Case C

A 73-year-old white man began boxing at the age of 11 years and fought as an amateur boxer for 9 years and as a professional boxer for 13 years. He fought a total of 48 professional bouts, accumulating 2 world championships before retiring at the age of 33 years. In his late 50s, he became forgetful with mood swings and restlessness. He changed from his normally happy easy-going self to become apathetic, socially withdrawn, paranoid, irritable, and sometimes violently agitated. During the next 2 years, he began to confuse close relatives and developed increasing anxiety, aggression, and agitation; on occasion, he was verbally abusive toward his wife and tried to strike her. He required neuroleptics for control of his behavior. The following year, he had episodes of dizziness, which was suspected to be vertigo, and resulted in a hospital admission. Neurological examination found him to be disoriented, inattentive, with very poor immediate and remote memory, and impaired visuospatial skills. Neuropsychological testing showed deficits in all cognitive domains, including executive functioning, attention, language, visuospatial abilities, and profound deficits in learning and memory. Computed tomographic scan and magnetic resonance imaging (MRI) showed generalized cortical atrophy, enlargement of the cerebral ventricles, cavum septum pellucidum, and a right globus pallidus lacuna. An electroencephalogram, an MR angiogram, and a carotid ultrasound were normal. He smoked and drank alcohol occasionally until his early 50s. A first cousin developed dementia in her early 50s, and 3 uncles and 1 aunt (of 11 children) were demented.

During the following 2 years, he continued to decline in all cognitive domains. He frequently fell and developed a tremor of his left hand. Repeat neuropsychological testing at age 67 years revealed further global deficits, again with prominent impairments in memory. By age 70 years, he had severe swallowing difficulties, diminished upgaze, masked facies, garbled speech, and a slow shuffling gait. Mini-Mental Status Examination several months before death was 7 out of 30. He died at the age of 73 years of complications of pneumonia.

CTE in Other Sports and Activities

Other sports associated with neuropathologically verified CTE are professional wrestling (20) and soccer (13). The first known case of CTE in a professional wrestler involved a 40-year-old white man who began professional wrestling at age 18 years and wrestled for the next 22 years (20). He was known for his rough aggressive style and had experienced numerous concussions and a cervical fracture during his career. At age 36 years, he began to experience problems in

his marriage, with periods of depression and lapses of memory. During his 40th year, he had episodes of violent behavior; he ultimately killed his wife and son and committed suicide. He was believed to have used anabolic steroids and prescription narcotics. His medical history included a motor vehicle accident at age 6 years requiring 3 days of hospitalization for mild TBI without known neurological sequelae.

Geddes and colleagues (13) reported finding mild changes of CTE in a 23-year-old amateur soccer player who regularly "headed" the ball while playing and had a history of a single severe head injury. Williams and Tannenberg (19) reported the findings of CTE in a 33-year-old achondroplastic dwarf, with a long history of alcohol abuse, who worked for 15 years as a clown in a circus. He had been knocked unconscious "a dozen times" and participated in dwarf-throwing events.

PATHOLOGICAL FEATURES OF CTE

Gross Pathology

In their comprehensive description of the pathology, Corsellis and colleagues (29) summarized the most common gross neuropathologic findings including 1) a reduction in brain weight, 2) enlargement of the lateral and third ventricles, 3) thinning of the corpus callosum, 4) cavum septum pellucidum with fenestrations, and 5) scarring and neuronal loss of the cerebellar tonsils. The reduction in brain weight is generally mild (mean, 1261 g; range, 950–1,833 g) and associated with atrophy of the frontal lobe (36%), temporal lobe (31%), parietal lobe (22%), and less frequently, occipital lobe (3%) (Tables 3–6). With increasing severity of the disease, atrophy of the hippocampus, entorhinal cortex, and amygdala may become marked. The lateral ventricles (53%) and III ventricles (29%) are frequently dilated; rarely, there is dilation of the IV ventricle (4%). Cavum septum pellucidum is often present (69%), usually with fenestrations (49%). Other common gross features include pallor of the substantia nigra and locus caeruleus, atrophy of the olfactory bulbs, thalamus, mammillary bodies, brainstem, and cerebellum, and thinning of the corpus callosum. Many of these gross pathological features were found in our Cases B and C.

Case B

The brain weighed 1,360 g. There was a mild yellow-brown discoloration in the leptomeninges over the temporal poles. There was mild atrophy of the frontal, parietal, and temporal lobes, most pronounced in the temporal pole. The floor of the hypothalamus was thinned and translucent, and the mammillary bodies were atrophic. The medial thalamus was atrophic and concave. The frontal, temporal, and occipital horns of the lateral and third ventricles were enlarged, with a 0.5-cm cavum septum pellucidum. The corpus callosum was thinned in its midportion. The anterior hippocampus, amygdala, and entorhinal cortex were severely atrophic. By contrast, the posterior hippocampus was only mildly atrophic. The substantia nigra and locus caeruleus were markedly pale.

Case C

The brain weighed 1,220 g. There was moderate atrophy of the frontal, parietal, and temporal lobes, most pronounced in the temporal pole. The floor of the hypothalamus was markedly thinned, and the mammillary bodies were atrophic. The corpus callosum was thinned, most prominently in its anterior portion. There was a large cavum septum pellucidum (0.8 cm) with fenestrations. The frontal and temporal horns of the lateral ventricles and the third ventricle were moderately enlarged. The entorhinal cortex, hippocampus, and amygdala were markedly atrophic throughout their entire extent. The medial thalamus was atrophic and concave. The perivascular spaces of the temporal and frontal white matter were prominent. A 1.0-cm lacuna was present in the internal segment of the right globus pallidus. There was severe pallor of the substantia nigra and locus caeruleus, with discoloration and atrophy of the frontopontine fibers in the cerebral peduncle.

See the appendix for methods of analysis for Cases A to C.

Microscopic Pathology

Neuronal Loss

A few reports in the literature (Cases 3, 4, 10, 12, 14, 29; Table 5) described neuronal loss and gliosis in the hippocampus, substantia nigra, and cerebral cortex without appreciable neurofibrillary pathology. Neuronal loss and gliosis most commonly accompany neurofibrillary degeneration, however, and are pronounced in the hippocampus, particularly the CA1 and subiculum, the entorhinal cortex, and amygdala. If the disease is advanced, neuronal loss is also found in the subcallosal and insular cortex and to a lesser degree in the frontal and temporal cortex. Other areas of neuronal loss and gliosis include the mammillary bodies, medial thalamus, substantia nigra, locus caeruleus, and nucleus accumbens. In Cases B and C, the cerebral cortex showed mild neuronal loss in the insular and septal cortices and moderate neuronal loss in the entorhinal cortex, amygdala, medial thalamus, mammillary bodies, substantia nigra pars compacta and pars reticulata, and to a lesser extent, locus caeruleus. In Case B, CA1 of the hippocampus showed moderate loss of neurons, and in Case C, CA1 and the subiculum of the hippocampus showed severe neuronal loss and gliosis.

Tau Deposition

Neurofibrillary tangles (NFTs), astrocytic tangles, and dotlike and spindle-shaped neuropil neurites (NNs) are common in the dorsolateral frontal, subcallosal, insular, temporal, dorsolateral parietal, and inferior occipital cortices. The tau-immunoreactive neurofibrillary pathology is characteristically irregular in distribution with multifocal patches of dense NFTs in the superficial cortical layers, often in a perivascular arrangement. This superficial distribution of neocortical NFTs was originally described by Hof and colleagues (47), who noted that the NFTs in CTE were preferentially distributed in layer II and the upper third of layer III in neocortical areas and generally more dense than in AD.

Geddes and colleagues (13, 37) drew attention to the perivascular distribution of NFTs in their description of the

TABLE 3. Gross Pathological Features: Atrophy

Case No.	Brain Weight, g	Thickened Leptomeninges	Atherosclerosis	Arteriolosclerosis	Cerebral Atrophy	Frontal Lobe	Parietal Lobe	Temporal Lobe	Occipital Lobe
1		++	0	++	+				
2					+				
3	(Biopsy)								
4						+++			
5	1,120	+	0			+	+		
6									
7									
8	1,180				+				
9		+	++	++	+	+			
10		+	++	++					
11		+	+						
12		+	+						
13		+	+						
14		+							
15	1,310	++	+						
16	960		+	++	+++	+++		+++	
17	1,260								
18	1,205	+			+	+			
19	1,095	+				++		++	
20	1,300	+				0	0	0	0
21	1,090	+							
22	1,040					+++		+++	
23	1,435								
24	1,095								
25	1,030								
26									
27	950					+			
28	1,395								
29									
30						+			
31									
32						+			
33									
34	1,833		0						
35						+	+	+	
36									
37									
38									
39	(Lobectomy)								
40									
41						+		+	
42								+	
43	1,565					0	0	0	0
44									
45	1,535					0	0	0	0
46	1,510					0	0	0	0
47									
48						++		++	
A*	(Fragments)	0	0	0	0	0	0	0	0
B*	1,360	0	0	++	+	+	+	+	0
C*	1,220	+	+	+	++	++	++	++	+

*New Cases A, B, and C of this series.
0, feature not present; +, mild; ++, moderate; +++, severe; blank, feature was not mentioned.

TABLE 3. *(Continued)*

Hippocampus	Entorhinal Cortex	Amygdala	Mammillary Bodies	Thalamus/ Hypothalamus	Brainstem	Cerebellum	Olfactory Bulb	Corpus Callosum
			+	+	+			
			+	+	+	+		+
			+	+	+	+		
				+	+	+	–	+
						+		+
				+		+	+	
					+	+		+
					+			
				+	+			
								+
			+					+
							+	
				+		+++		++
0	0	0						
+++	+++	+++	++	+	0	0	0	+
+++	+++	+++	++	++	0	0	+	+

TABLE 4. Gross Pathological Features: Other

Case No.	II Ventricle Enlarged	III Ventricle Enlarged	IV Ventricle Enlarged	Cavum Septum	Fenestrations	SN Pallor	LC Pallor
1	+	+					
2	+			+			
3							
4	+++						
5	+	+					
6				+			
7				+			
8				+		+++	
9	+			+	+		
10	+			+	+		
11	+			+			+
12	+			+			
13	+			+	+		
14	+			+			
15	++	++		+++	+	++	
16	+++	+++	+++	+++	+	++	
17	++	++		++	+	+++	
18	++	++		+	+	+++	
19	++	++	+	+++	+	+	
20	++	++		++	+	+++	
21	++	++		++	+		
22	++	++	+	++	+		
23	++			++	+	+++	
24	+++	+++		+++	+		
25	++			+++	+		
26	+			+			
27	++	++		++	+		
28	++	++		++			
29				+	+		
30				+++	+		
31				+++			
32				+	+		
33							
34	+++	+++			+		
35					+		
36				0	0	0	
37				0	0	0	
38				0	0	0	
39							
40				0	0	0	
41				+		++	++
42				+			
43						+	
44							
45				+			
46							
47							
48	++			+	+		
A*		+				0	0
B*	+	+		+	+	+++	+++
C*	++	++		++	+	+++	+++

*New Cases A, B, and C of this series.
0, feature not present; +, mild; ++, moderate; +++, severe; blank, feature was not mentioned.
LC, locus caeruleus; SN, substantia nigra.

TABLE 5. Microscopic Pathological Features: Neuronal Loss

Case No.	Frontal Cortex	Parietal Cortex	Temporal Cortex	Occipital Cortex	Hippocampus	Entorhinal Cortex	Amygdala	Cerebellum
1								
2								
3	+++	+++	+++					
4	+++	+++	+++					
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15	+							
16	+++	+++	+++					
17								
18								
19								
20	+	+	+	+				
21								
22	+	+	+	+				
23	+	+	+	+				
24								
25								
26	+++	+++	+++	+++				
27								
28								
29								
30								
31								
32								
33								
34								
35								
36								
37								
38								
39								
40								
41								
42								
43								
44								
45								
46								
47								
48	++	++	++	++	++			
A*	0	0	0	0	+	+	+	
B*	+	+	+	+	++	++	++	
C*	++	++	++	++	+++	+++	+++	

*New Cases A, B, and C of this series.
0, feature not present; +, mild; ++, moderate; +++, severe; blank, feature was not mentioned.

TABLE 6. Microscopic Pathological Features: Other

	NFT										
Case No.	Frontal	Parietal	Temporal	Occipital	Thalamus	Hypothalamus	Septal Nuclei	Globus Pallidus	Caudate/ Putamen	Nucleus Basalis of Meynert	Mammillary Bodies
1	+	+	+	+							
2	+	+	+		+	+					
3											
4											
5	+	+	+								
6	+	+	+								
7	+	+	+								
8	+		+	+							
9											
10											
11	+	+	+								
12											
13	+	+	+								
14											
15	+										
16	+++	+++	+++								
17	+	+	+								
18	+++		+++								
19	+++	+++	+++	+++							
20	+	+	+								
21	+	+	+	+							
22	++	++	++	++							
23	++	++	++	++							
24			+								
25			+								
26	+++	+++	+++	+++							
27											
28	+	+	+	+							
29											
30	++	+	+								
31		++									
32	+		+							+	
33			+								
34			+								
35											
36			+								
37			+								
38			+								
39			+								
40			+								
41	++		+					++	++		
42	+		+								
43	+	+	+								
44	+		+								
45	+++		+++	++	+				+		++
46	+	+	+					+	+		
47											
48	++	++	++	0							
A*	+++	++	+++	++	+	+++	+++	0	+	+++	+++
B*	+++	+++	+++	++	++	+++	+++	+	++	+++	+++
C*	+++	+++	+++	++	+++	+++	+++	+	++	+++	+++

*New Cases A, B, and C of this series.
0, feature not present; +, mild; ++, moderate; +++, severe; blank, feature was not mentioned.
Aβ, β-amyloid; LC, locus coeruleus; NFT, neurofibrillary tangles; SN, substantia nigra; SP, senile plaques.

TABLE 6. *(Continued)*

NFT											
Hippocampus	**Entorhinal Cortex**	**Amygdala**	**Periventricular Gray**	**Midbrain Tegmentum**	**SN**	**LC**	**Basis Pontis**	**Medulla**	**Inferior Olive**	**Red Nucleus**	**Cranial Nerves 3, 4 Nuclei**
+++											
+++					+++						
+++	+++	+++	+++	+++	+++	+++					
+					+						
					+	+					
					+						
+											
+			+		+	+					+
0											
0											
0											
0											
0											
+++											
+++											
0											
++	++				+	+	+	+			
++	++	++	+	+	++	++	+++	++			
					+	+					
+++					+	+					
++	+++	++	+	+	++						
+++	+++	+++	++	++	+++	+++	+	+	+	+	+
+++	+++	+++	++	++	+++	+++	++	++	++	++	++

TABLE 6. *(Continued)*

NFT				Aβ						
Cranial Nerve 12 Nucleus	Spinal Cord	Cerebellar Dentate	Olfactory Bulb	Diffuse Plaques	Neuritic Plaques	Congophilic Angiopathy	NFT Only	NFT + SP	SP Only	No NFT/No SP
				+++	++	++		+++		
							+++			
										+
										+
							+			
							+			
							+			
							+			
				+	+				+	
				0	0					+
				0	0		+			
				0	0					+
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				+				+		
				+				+		
				+				+		
				++	++			+		
				+	+			+		
										+
				+	+			+		
				+++	++			+		
				0	0	0				
				0	0	0				
				+	+	+		+		
				++	++	++		+		
							+			
							+			
							+			
							+			
							+			
	+++			+	+			+		
							+			
				+				+		
		++++		+	+		+			
							+			
		0	++	0	0	0	+			
0	++	+	+++	++	+	0		+		
+++	++	++	+++	0	0	0	+			

neuropathologic alterations in the brain and frontal lobectomy specimens of 5 young men, ranging in age from 23 to 28 years. The 5 cases included 2 boxers, a soccer player, a person described as "mentally subnormal" with a long history of head banging, and a patient with epilepsy who frequently hit his head during seizures. Microscopically, all the brains showed argyrophilic tau-positive neocortical NFTs, strikingly arranged in groups around small intracortical blood vessels, associated with neuropil threads and granular tau-positive neurons. There were also NFTs along the basal surfaces of the brain, usually at the depths of sulci. The hippocampi of the 4 autopsy cases were normal.

In CTE, tau-immunoreactive protoplasmic astrocytes are interspersed throughout the superficial cortical layers appearing as plaquelike accumulations composed of primarily globular neurites. The corpus callosum and subcortical white matter of the cortex show NNs and fibrillar astrocytic tangles. The U-fibers are prominently involved. Subcortical white matter structures such as the extreme and external capsule, anterior and posterior commissures, thalamic fasciculus, and fornix also show NNs and astrocytic tangles.

Dense NFTs, ghost tangles, and astrocytic tangles are found in the olfactory bulbs, hippocampus, entorhinal cortex, and amygdala, often in greater density than is found in AD. Abundant NFTs and astrocytic tangles are also found in the thalamus, hypothalamus, mammillary bodies, nucleus basalis of Meynert, medial geniculate, substantia nigra (pars compacta more than the pars reticulata), locus caeruleus, superior colliculus, periaqueductal gray, medial lemniscus, oculomotor nucleus, trochlear nucleus, ventral tegmental area, dorsal and median raphe, trigeminal motor nucleus, pontine nuclei, hypoglossal nucleus, dorsal motor nucleus of the vagus, inferior olives, and reticular formation. The nucleus accumbens is usually moderately affected; the globus pallidus, caudate, and putamen are less involved. In the brainstem and spinal cord, midline white matter tracts show dense astrocytic tangles especially around small capillaries. Fibrillar astrocytic tangles are also common in the subpial and periventricular zones. Neurons in the spinal cord gray matter contain NFTs, and astrocytic tangles are frequent in the ventral gray matter. This unique pattern of tau-immunoreactive pathology was found in all 3 of our cases, with increasing severity from Case A to Case C.

Case A

Neurofibrillary tangles immunopositive for tau epitopes (Appendix) were prominent in the inferior frontal, superior frontal, subcallosal, insular, temporal, and inferior parietotemporal cortices (Fig. 1). Primary visual cortex showed no NFTs; anterior and posterior cingulate cortex showed only scant NFTs. Neurofibrillary tangles occurred in irregular patches, often greatest at the sulcal depths (Fig. 2). Tau-positive fibrillar astrocytes ("astrocytic tangles") were prominent in foci, especially in subpial regions and around small blood vessels (Figs. 2, 3). Neurofibrillary tangles were especially numerous in cortical laminae II and III, where a prominent perivascular distribution of neuronal NFTs and fibrillar astrocytic tangles was evident (Fig. 3). Although some neuronal NFTs showed multiple tau-positive perisomatic processes, most neuronal NFTs were morphologically similar to those found in AD. In the cortex, there were many tau-positive astrocytes bearing a corona of tau-positive processes. These tau-positive protoplasmic astrocytes were similar in appearance to the astrocytic plaques of corticobasal degeneration, except that the perikaryon was often tau positive (Fig. 3).

Neuropil neurites and astrocytic tangles were abundant in the frontal and temporal white matter (Fig. 3). Neuropil neurites were often dotlike and spindle-shaped, in addition to threadlike forms similar to those found in AD. The hippocampus, entorhinal, and transentorhinal cortex contained dense NFTs, ghost tangles, and NNs, including many ghost tangles in CA1 and subiculum; NFTs were denser in the anterior hippocampus compared with the posterior hippocampus. The amygdala showed dense tau immunoreactivity, including NFTs, astrocytic tangles, and NNs (Fig. 4). Neurofibrillary tangles were most frequent in the lateral nuclear group of the amygdala.

The nucleus basalis of Meynert, hypothalamic nuclei, septal nuclei, fornix, and lateral mammillary bodies showed dense NFTs and astrocytic tangles. Neurofibrillary tangles and astrocytic tangles were also found in the olfactory bulb, thalamus, caudate, and putamen. The globus pallidus and

FIGURE 1. Case A. Whole-mount 50-μm coronal sections immunostained for tau with monoclonal antibody AT8 and counterstained with cresyl violet showing irregular patchy deposition of phosphorylated tau protein in frontal, subcallosal, insular, temporal, and parietal cortices and the medial temporal lobe.

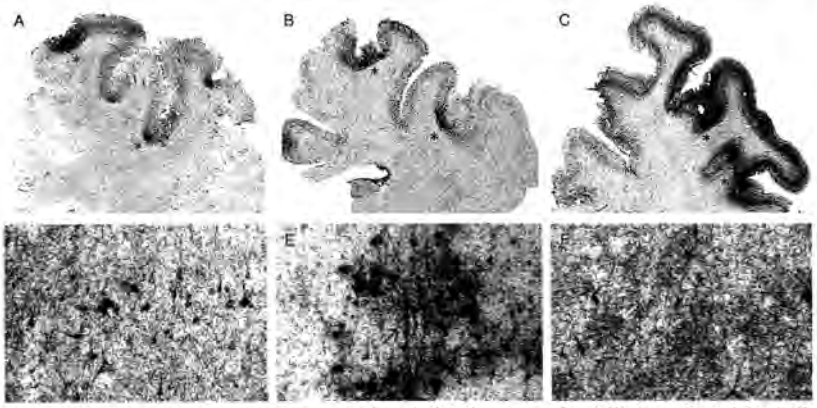

FIGURE 2. (A–C) Whole-mount 50-μm coronal sections of superior frontal cortex from Case A **(A)**, Case B **(B)**, and Case C **(C)** immunostained for tau with monoclonal antibody CP-13 showing extensive immunoreactivity that is greatest at sulcal depths (asterisks) and is associated with contraction of the cortical ribbon. **(D–F)** Microscopically, there are dense tau-immunoreactive neurofibrillary tangles (NFTs) and neuropil neurites throughout the cortex, Case A **(D)**, Case B **(E)**, and Case C **(F)**. There are focal nests of NFTs and astrocytic tangles around small blood vessels **(E**, arrow**)** and plaquelike clusters of tau-immunoreactive astrocytic processes distributed throughout the cortical layers **(F**, arrows**)**.

subthalamic nucleus were relatively spared. The lateral substantia nigra pars compacta showed mild neuronal loss, extraneuronal pigment deposition, and moderate numbers of NFTs and NNs. The pars reticulata was unremarkable. The cerebellar peduncle showed mild perivascular hemosiderin deposition. Neurofibrillary tangles were numerous in the dorsal and median raphe nuclei. The internal, external, and extreme capsules, fornix, and mammillothalamic tract showed moderate NNs, although in general, the white matter was less affected than adjacent gray matter.

Case B

There were abundant tau-positive NFTs, glial tangles, and dotlike and spindle-shaped NNs in the superficial layers of cerebral cortex (I–III) (Fig. 3). Cortical tau pathology was most prominent in patchy areas of the superior frontal and temporal lobes, especially the medial temporal lobe, often in a vasocentric pattern. The olfactory bulb, hippocampus, entorhinal cortex, and amygdala showed extremely dense NFTs with many ghost tangles (Figs. 4–6). Tau-positive glia and NNs were also found in the subcortical white matter and corpus callosum. The olfactory bulb, thalamus, hypothalamus, nucleus basalis, striatum, globus pallidus, substantia nigra, raphe, periventricular gray, locus caeruleus, oculomotor nucleus, red nucleus, pontine base, tegmentum, reticular nuclei, inferior olives, and dentate nucleus showed dense NFTs and glial tangles. Spindle-shaped NNs and tau-positive glia were pronounced in the midline white matter tracts of the brainstem.

Case C

Microscopic examination showed dense accumulations of tau-immunoreactive NFTs, astrocytic tangles, and NNs in irregular patches of the dorsolateral frontal, insular, subcallosal, inferior frontal, superior parietal, and posterior temporo-occipital cortices, and most severely in the medial temporal lobe. The hippocampus, entorhinal cortex, and amygdala contained extremely dense NFTs with ghost tangles and severe neuronal loss (Figs. 4, 6). Tau-positive glia and NNs were also found in the subcortical white matter, particularly in the subcortical U fibers. The olfactory bulb, thalamus, hypothalamus, nucleus basalis, striatum, globus pallidus, substantia nigra, raphe, periventricular gray, locus caeruleus, oculomotor nucleus, red nucleus, pontine base, pontine tegmentum, hypoglossal nuclei, reticular nuclei, inferior olives, midline tracts of the medulla, and dentate nucleus contained dense NFTs and astrocytic tangles (Figs. 5, 7). Subcortical white matter tracts including the anterior and posterior commissure, thalamic fasciculus, and external and extreme capsule also showed astrocytic tangles and NNs.

The abnormal tau proteins that are found in the glial and neuronal tangles in CTE are indistinguishable from NFTs in AD and are composed of all 6 brain tau isoforms (39). Neuropathologically, CTE resembles several other neurodegenerative diseases characterized by accumulations of hyperphosphorylated tau protein in neurons or glial cells, including ALS/PDC of Guam, postencephalitic parkinsonism, PSP, corticobasal degeneration, and frontotemporal

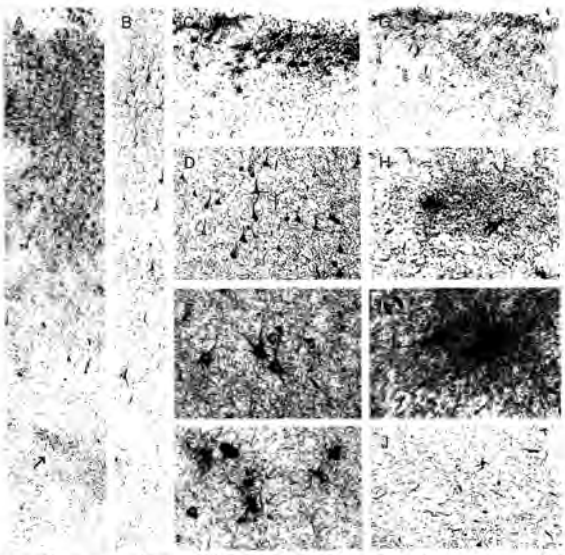

FIGURE 3. Whole-mount 50-μm sections from Cases A and B immunostained with anti-tau monoclonal antibody AT8. **(A)** Case B. There is a prominent perivascular collection of neurofibrillary tangles (NFTs) and astrocytic tangles evident in the superficial cortical layers with lesser involvement of the deep laminae. Prominent neuropil neurites (NNs) are found in the subcortical U-fibers (arrow). Original magnification: 150×. **(B)** Case A. There is a preferential distribution of NFTs in Layer II and NNs extending into the subcortical white matter even in mildly affected cortex. Original magnification: 150×. **(C)** Case A. Focal subpial collections of astrocytic tangles and NFTs are characteristic of chronic traumatic encephalopathy (CTE). Original magnification: 150×. **(D)** Case A. The shape of most NFTs and NNs in CTE is similar to those found in Alzheimer disease. Original magnification: 150×. Some NFTs have multiple perisomatic processes **(E)**, and spindle-shaped and dotlike neurites are found in addition to threadlike forms. **(E)** Case A. Original magnification: 350×. **(F)** Case A. Astrocytic tangles are interspersed with NFTs in the cortex (arrows). Original magnification: 350×. **(G)** Case A. Tau-immunoreactive astrocytes are common in periventricular regions. Original magnification: 150×. **(H, I)** Case A. Tau-immunoreactive astrocytes take various forms; some appear to be protoplasmic astrocytes with short rounded processes **(H, I)** double immunostained section with AT8 (brown) and anti-glial fibrillary acidic protein (red). **(H)** Original magnification: 350×. **(I)** Original magnification: 945×. **(J)** Case B. Dotlike or spindle-shaped neurites predominate in the white matter, although there are also some threadlike forms. Original magnification: 150×.

dementia with parkinsonism linked to chromosome 17 (FTDP-17) (36, 48–50). Similar to ALS/PDC of Guam, neurofibrillary tau pathology in CTE is found in the medial temporal lobe structures, cerebral cortex, and spinal cord, with only a subset of cases showing evidence of diffuse plaques (51). Similar to ALS/PDC and PSP, CTE preferentially involves the superficial cortical layers and involves the accumulation of tau-immunoreactive astrocytes (36). However, CTE differs from ALS/PDC of Guam and PSP in that the cortical involvement is irregular and patchy, greatest at sulcal depths, and distributed in a prominent perivascular, periventricular, and subpial pattern. Furthermore, there is a unique regional involvement of subcortical and brainstem structures in CTE (Tables 5, 6).

β-Amyloid Deposition

β-Amyloid (Aβ) deposition is an inconstant feature in CTE. Fourteen of the 15 brains originally described by Corsellis et al (29) and 6 additional boxers were reexamined by Roberts and colleagues (18) using Aβ immunocytochemistry with formic acid pretreatment; 19 of the 20 cases showed widespread diffuse Aβ deposits. Similarly, Tokuda and colleagues (52) found abundant diffuse Aβ deposits in 8 cases of CTE and cerebrovascular Aβ deposits in 3 cases. In

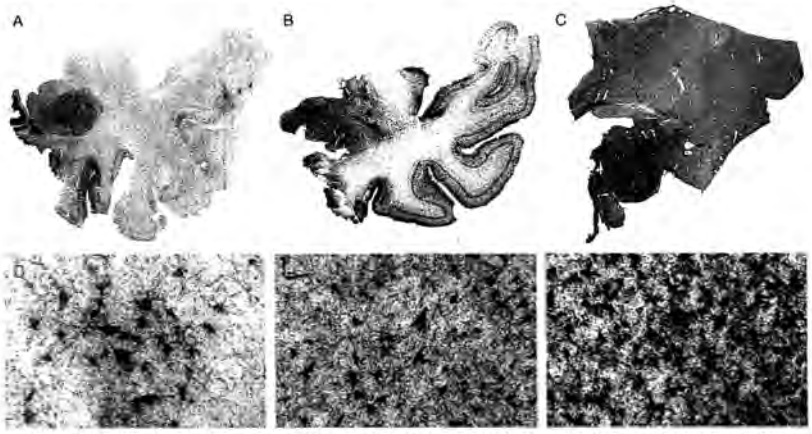

FIGURE 4. **(A–C)** Whole-mount 50-μm-thick coronal sections immunostained for tau (AT8) from Case A **(A)**, Case B **(B)**, and Case C **(C)** counterstained with cresyl violet showing extremely dense deposition of tau protein in the amygdala with increasing severity from left to right. **(D–F)** Microscopically, there is a moderate density of neurofibrillary tangles and astrocytic tangles in Case A **(D)**, the density is increased in Case B **(E)**, and extremely marked in Case C **(F)**. Original magnification: 350×.

our series, only Case B showed moderate numbers of diffuse Aβ plaques in the frontal, parietal, and temporal cortices, and sparse neuritic plaques; there was no vascular amyloid. Of the 51 neuropathologically verified cases of CTE, diffuse plaques were found in 24 (47%), neuritic plaques in 13 (27%), and amyloid angiopathy in 3 (6%). There was also 1 report of a fatal cerebral hemorrhage from amyloid angiopathy associated with CTE (15).

White Matter Changes and Other Abnormalities

Tau-positive fibrillar astrocytic tangles are found in the white matter, but the major abnormality is that of dotlike or spindle-shaped tau-positive neurites. The shape of the tau-immunoreactive neurites is distinct from the predominantly threadlike forms found in AD and suggests an axonal origin. Tokuda and colleagues (52) characterized the NNs in CTE as shorter and less prominent than the neuropil threads found in AD and not spatially related to senile plaques. Generally, tau abnormalities in the white matter are not as severe as in adjacent gray matter. Other abnormalities frequently found in the cerebral and cerebellar white matter include small arterioles with thickened fibrohyalinized walls with perivascular hemosiderin-laden macrophages, widened perivascular spaces, and white matter rarefaction. In our Cases A to C,

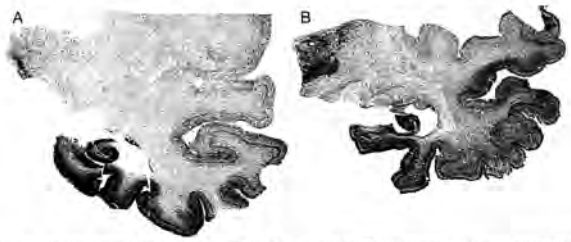

FIGURE 5. Whole-mount 50-μm coronal sections of Case B **(A)** and Case C **(B)** immunostained for tau (AT8) and counterstained with cresyl violet. There is extremely dense deposition of tau protein in the hippocampus and medial temporal lobe structures. There is also prominent tau deposition in the medial thalamus.

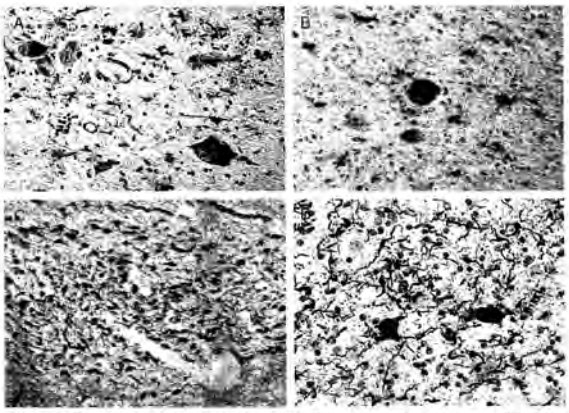

FIGURE 6. Tau-immunoreactive (AT8) neurofibrillary tangles (NFT), astrocytic tangles, and neuropil neurites are found in many subcortical nuclei including the substantia nigra ([A] Case C. Original magnification: 350×) and nucleus basalis of Meynert ([B] Case C. Original magnification: 350×). The NFTs are also abundant in the olfactory bulb ([C] Case B. Bielschowsky silver method. Original magnification: 150×) and thalamus (Case A. Original magnification: 350×. The AT8 immunostain counterstained with cresyl violet).

mild to moderate myelin and axonal losses were found in the corpus callosum and subcortical white matter of the frontal and temporal lobes and cerebellum, with mild perivascular hemosiderin deposition.

α-Synuclein Staining

Extensive accumulation of α-synuclein has been found in axons after acute TBI (53), but α-synuclein immunostaining was not a feature of any of the 51 cases of CTE, including our 3 cases.

CLINICOPATHOLOGIC CONSIDERATIONS

The distribution of the tau abnormalities in CTE suggests distinctive core pathology within the amygdalo-hippocampal-septo-hypothalamic-mesencephalic continuum, that is, the Papez circuit (54, 55). The early involvement of these anatomical regions, sometimes referred to as *emotional* or *visceral* brain, may underlie many of the early behavioral symptoms, including the tendency toward emotional lability, aggression, and violent outbursts. The early involvement of the hippocampus, entorhinal cortex, and medial thalamus may explain episodic memory disturbance as a frequent presenting symptom (56). Neurofibrillary degeneration of the frontal cortex and underlying white matter most likely contributes to the dysexecutive symptoms. Although less common and generally less severe, neurofibrillary degeneration in the dorsolateral parietal, posterior temporal, and occipital cortices likely accounts for the visuospatial difficulties. The parkinsonian features found in 41.1% of cases are likely caused by degeneration of the substantia nigra pars compacta. The gait

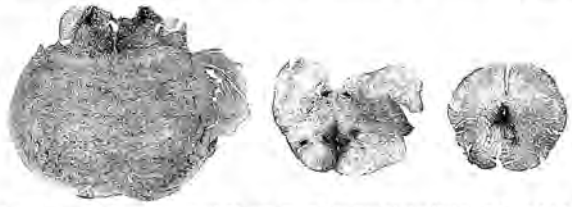

FIGURE 7. Whole-mount tau (AT8)-immunostained 50-μm coronal sections of the brainstem from Case C showing severe involvement of the locus caeruleus, pontine tegmentum, pontine base, midline medulla, and hypoglossal nuclei.

disorder, variously described as staggered, slowed, shuffled, or frankly ataxic, may result from a combination of cortical and subcortical frontal damage, degeneration of cerebellar tracts in the brainstem, direct cerebellar injury, as well as parkinsonism from substantia nigra pathology. Similarly, speech abnormalities, most often described as slowed and slurred, likely reflect multiregional degeneration. Symptoms of dysarthria, dysphagia, and ocular abnormalities probably result from degeneration of brainstem nuclei, for example, the hypoglossal and oculomotor nuclei.

POSSIBLE MECHANISMS OF CEREBRAL INJURY

Acceleration and deceleration forces are thought to be important events in concussion, particularly rotational acceleration and deceleration (57–59). Sagittal (front-to-back) injuries result in relatively good recovery, whereas lateral (side-to-side) injuries produce the most injury, with injury directed related to the severity of the generating force (58). Conceivably, a concussive impact imparts a fluid wave in the lateral ventricles that produces a shearing force on the septum pellucidum; this may explain the development of an enlarged cavum septum pellucidum and, if severe or repeated, fenestrations.

The patchy irregular location of the cortical NFTs and astrocytic tangles suggests that the distribution is related to direct mechanical injury from blows to the side or top of the head, given their multifocal dorsolateral frontal and parietal, inferior frontal and occipital, and lateral temporal distribution. The possibility that ischemia may contribute to the development of the tau pathology is suggested by the concentration of tau-immunoreactive pathology at the depths of sulci. Damage to the blood-brain barrier and release of local neurotoxins might explain some of the tendency toward perivascular nests of tau-immunoreactive NFT, tau-positive glia, and NNs (13). Buee et al (60) studied the microvasculature of several cases of dementia pugilistica and found decreased microvascular density and tortuosity, with a strong correlation between the laminar distribution of NFTs and pathological microvasculature. Buee and colleagues (60) suggested that the shear forces of repetitive head trauma might lead to vascular damage followed by perivascular NFT and NN formation. Further supporting a possible vascular connection to the pathological changes in CTE, Bouras et al (61) reported that, upon laser microprobe mass analysis, NFTs and nuclei of NFT-free neurons in CTE contained substantially higher amounts of iron and aluminum than NFTs in AD.

Acute TBI

Axonal Injury

Acute concussion produces diffuse axonal injury (62). The "diffuse degeneration of the cerebral white matter" was first described by Strich (63) as the shearing or mechanical tearing of axons at the time of injury. It is now appreciated that axons are not sheared at the time of injury, except in the most severe instances of diffuse axonal injury, but instead undergo a series of changes that may result in a secondary axotomy within 24 hours (64). The axolemma is one of the initial sites of injury; the increased permeability, uncontrolled influx of Ca++, swelling of mitochondria, disruption of microtubules, and alterations in axonal transport that follow produce axonal swelling and secondary axotomy (64–66). Rapid axonal swelling, perisomatic axotomy, and Wallerian degeneration may also occur without changes in axolemmal permeability, suggesting that trauma may have diverse effects on axons. McKenzie et al (67) showed that 80% of patients who died of acute head injury showed immunocytochemical evidence of axonal injury within 2 hours of injury; after 3 hours of injury, axonal bulbs were identified, and as the survival time increased, the amount of axonal damage and axonal bulb formation increased. Axonal injury was found most frequently in the brainstem, followed by the internal capsule, thalamus, corpus callosum, and parasagittal white matter (67). Axonal damage may continue for weeks after the acute TBI (68).

Deposition of Abnormal Proteins

In individuals undergoing surgical brain tissue resection for acute TBI, tau-immunoreactive dystrophic axons were found in the white matter, and diffuse tau immunoreactivity was found in some neuronal cell bodies, dendrites, and glial cells within 2 to 3 hours postinjury (67). Studies of acute TBI in experimental animal models and postmortem human brain also demonstrate that Aβ deposition and amyloid precursor protein processing, production, and accumulation are increased after injury (69–78). Increased amyloid precursor protein production in experimental TBI has also been associated with heightened neuronal loss in the hippocampus (73, 79). In acute TBI, diffuse cortical Aβ plaques have been found in 30% to 38% of cases as early as 2 hours after injury (73, 76, 80). In addition, individuals with cortical Aβ plaques showed increased levels of soluble $A\beta_{42}$, and half were apolipoprotein E (ApoE) ε4 allele carriers (81). In acute TBI, Aβ deposition is widely distributed throughout the neocortex without apparent association with the injury sites (82). The predominant form of Aβ in acute TBI is $A\beta_{42}$, whereas the $A\beta_{40}$ form predominates in serum and cerebrospinal fluid, a situation similar to that in AD (83). A recent report also showed that interstitial soluble Aβ concentrations in the brain seem to directly correlate with neurological outcome after TBI (84).

NEURONAL DEATH IN ACUTE TBI AND RELATIONSHIP TO CTE

There are multiple reasons for neuronal loss in acute traumatic injury including neuronal death from direct physical damage, necrosis from the immediate release of excitatory transmitters such as glutamate, and diffuse delayed cell death involving both necrotic and apoptotic death cascades (85, 86). Other contributing factors include focal ischemia, breakdown of the blood-brain barrier, inflammation, and the release of cytokines. Experimental lateral percussive injury in the rat produces apoptotic and necrotic neuronal death that progresses for up to 1 year after injury, with degeneration of the cortex, hippocampi, thalami, and septum, ventriculomegaly, and impaired memory performance (62, 85, 87–89). The thalamic degeneration typically follows the cortical degeneration by weeks, suggesting that a secondary process

such as deafferentation may play a role in the thalamic neuronal death. Neuronal loss in the hippocampus and thalamus has also been reported after blunt head injury in humans using stereological techniques (90, 91). One of the key features of CTE is that the disease continues to progress decades after the activity that produced traumatic injury has stopped. It is most likely that multiple pathological cascades continue to exert their effects throughout the individual's lifetime once they are triggered by repetitive trauma; the longer the survival after the initial events and the more severe the original injuries, the greater the severity of the neurodegeneration. It is clear that neuronal loss, cerebral atrophy, and ventricular enlargement all increase with longer survival and greater exposure to repetitive trauma.

DIAGNOSIS OF CTE

Presently, there are no available biomarkers for the diagnosis of CTE. Although significant decreases in cerebrospinal fluid ApoE and Aβ concentrations have been reported that correlated with severity of the injury after TBI, there have been no similar studies in CTE (92). Nonetheless, advances in neuroimaging offer the promise of detecting subtle changes in axonal integrity in acute TBI and CTE. Standard T1- or T2-weighted structural MRI is helpful for quantitating pathology in acute TBI, but diffusion tensor MRI (DTI) is a more sensitive method to assess axonal integrity in vivo (93, 94). In chronic moderate-to-severe TBI, abnormalities on DTI have been reported in the absence of observable lesions on standard structural MRI (83). More severe white matter abnormalities on DTI have been associated with greater cognitive deficits by neuropsychological testing (94, 95), and increases in whole-brain apparent diffusion coefficient and decreases in fractional anisotropy using DTI have been found in boxers compared with controls (96, 97).

GENETIC RISK AND THE ROLE OF APOE4

Apolipoprotein E genotyping has been reported in 10 cases of CTE, including our most recent cases. Five (50%) of the 10 cases of CTE carried at least 1 ApoE ε4 allele, and 1 was homozygous for ApoE ε4 (our Case A). The percentage of ApoE ε4 carriers in the general population is 15%; this suggests that the inheritance of an ApoE ε4 allele might be a risk factor for the development of CTE.

In acute TBI, there is accumulating evidence that the deleterious effects of head trauma are more severe in ApoE ε4–positive individuals (98–100). Acute TBI induces Aβ deposition in 30% of people (75, 76), and a significant proportion of these individuals are heterozygous for ApoE ε4 (101, 102). Apolipoprotein E4 transgenic mice experience greater mortality from TBI than ApoE ε3 mice (102). Furthermore, transgenic mice that express ApoE ε4 and overexpress amyloid precursor protein show greater Aβ deposition after experimental TBI (103).

GUIDELINES FOR PREVENTION AND TREATMENT

Clearly, the easiest way to decrease the incidence of CTE is to decrease the number of concussions or mild TBIs. In athletes, this is accomplished by limiting exposure to trauma, for example, by penalizing intentional hits to the head (as is happening in football and hockey) and adhering to strict "return to play" guidelines. Proper care and management of mild TBI in general and particularly in sports will also reduce CTE. No reliable or specific measures of neurological dysfunction after concussion currently exist, and most recommendations are centered on the resolution of acute symptoms such as headache, confusion, sensitivity to light, and so on (104). Asymptomatic individuals have been shown, however, to have persistent decreases in P300 amplitudes in response to an auditory stimulus at least 5 weeks after a concussion, thereby casting doubt on the validity of the absence of symptoms as a guidepost (105, 106). Neuropsychological tests have also helped provide estimates of the appropriate time for athletes to return to practice and play. Studies using event-related potentials, transcranial magnetic stimulation, balance testing, multitask effects on gait stability, positron emission tomography, and DTI MRI have all shown abnormalities in concussed athletes or nonathletes with TBI lasting for 2 to 4 weeks (105, 107–109). These studies indicate that safe return to play guidelines might require at least 4 to 6 weeks to facilitate more complete recovery and to protect from reinjury, as a second concussion occurs much more frequently in the immediate period after a concussion (106, 110). In addition, experimental evidence in animals suggests that there is expansion of brain injury and inhibition of functional recovery if the animal is subjected to overactivity within the first week (111).

CONCLUSIONS

Chronic traumatic encephalopathy is a progressive neurodegeneration clinically associated with memory disturbances, behavioral and personality changes, parkinsonism, and speech and gait abnormalities. Pathologically, CTE is characterized by cerebral and medial temporal lobe atrophy, ventriculomegaly, enlarged cavum septum pellucidum, and extensive tau-immunoreactive pathology throughout the neocortex, medial temporal lobe, diencephalon, brainstem, and spinal cord. There is overwhelming evidence that the condition is the result of repeated sublethal brain trauma that often occurs well before the development of clinical manifestations. Repetitive closed head injury occurs in a wide variety of contact sports as well as a result of accidents or in the setting of military service. Pathologically, CTE shares some features of AD, notably tau-immunoreactive NFTs, NNs, and in approximately 40% of cases, diffuse senile plaques. Furthermore, the Aβ and NFTs found in CTE are immunocytochemically identical to those found in AD, suggesting a possible common pathogenesis. Multiple epidemiological studies have shown that head injury is a risk factor for AD, and there have been several case reports citing an association between a single head injury and the development of subsequent AD (112, 113). Just as acquired vascular injury may interact additively or synergistically with AD, traumatic injury may interact additively with AD to produce a mixed pathology with greater clinical impact or synergistically by promoting pathological cascades that result in either AD or CTE. In athletes, by instituting and following proper

guidelines for return to play after a concussion or mild TBI, it is possible that the frequency of sports-related CTE could be dramatically reduced or, perhaps, entirely prevented.

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APPENDIX

Methods for Analysis of Cases A to C

The following anatomical regions were microscopically evaluated in paraffin sections in Cases A to C: olfactory bulb, midbrain at level of red nucleus, right motor cortex, right inferior parietal cortex (Brodmann Area [BA] 39, 40), right anterior cingulate (BA 24), right superior frontal (BA 8, 9), left inferior frontal cortex (BA 10, 11, 12), left lateral frontal (BA 45, 46), caudate, putamen, and accumbens (CAP), anterior temporal (BA 38), superior temporal (BA 20, 21, 22), middle temporal cortex, inferior temporal cortex, amygdala, entorhinal cortex (BA 28), globus pallidus, insula, substantia innominata, right hippocampal formation at the level of the lateral geniculate, hippocampus, thalamus with mammillary body, thalamus, posterior cingulate (BA 23, 31), calcarine cortex (BA 17,18), superior parietal cortex (BA 7B), cerebellar vermis, cerebellum with dentate nucleus, parastriate cortex (BA 19) pons, medulla, and spinal cord.

The sections were stained with Luxol fast blue and hematoxylin and eosin, Bielschowsky silver impregnation, and by immunohistochemistry with antibodies to phosphoserine 202 and phosphothreonine 205 of PHF-tau (mouse monoclonal AT8; Pierce Endogen, Rockford IL; 1:2000), α-synuclein (rabbit polyclonal; Chemicon, Temecula, CA; 1:15,000), Aβ (mouse monoclonal; Dako North America Inc, Carpinteria, CA; 1:2000) (after formic acid pretreatment), and Aβ 42 (rabbit polyclonal; Invitrogen [Biosource], Carpinteria, CA; 1:2000). In addition, multiple large coronal fragments were cut at 50 μm on a sledge microtome and stained as free-floating sections using a mouse monoclonal antibody directed against phosphoserine 202 of tau (CP-13; courtesy of Peter Davies; 1:200); this is considered to be the initial site of tau phosphorylation in NFT formation (114–118). Other monoclonal antibodies used for immunostaining were AT8, phosphoserine 396, and phosphoserine 404 of hyperphosphorylated tau (PHF-1; courtesy of Peter Davies; 1:1000) (114–118), glial fibrillary acidic protein (Chemicon; 1:2000), and HLA-DR-Class II major histocompatibility complex (LN3; Zymed, San Francisco, CA; 1:2000); some of these sections were counterstained with cresyl violet.

Mr. CONYERS. Dr. Joseph Maroon, board certified Clinical Professor of Neurological Surgery, the University of Pittsburgh Medical Center, Vice Chairman of the Department and the Heindl Scholar in neuroscience. He has clinical and research interests. He has worked with neuropsychologist Mark Lovell, and with him they have developed the first computerized system to determine concus-

sion severity and the timing for return to contact sports. It is now the standard of care for concussion management in the football league, the hockey league, Major League Baseball, NASCAR and is used in over 2,500 colleges and high schools in the United States.

He has been team neurosurgeon to the Pittsburgh Steelers for 20 years and honored by neurosurgical societies around the world, and has been honored in more than one Hall of Fame in addition.

We are delighted and honored you would be with us today, Dr. Maroon. You are invited to proceed.

TESTIMONY OF JOSEPH MAROON, M.D., VICE CHAIR, DEPARTMENT OF NEUROSURGERY, UNIVERSITY OF PITTSBURGH

Dr. MAROON. Thank you very much, sir. I am here first as a neurosurgeon from the University of Pittsburgh Medical Center, with a career-long interest in preventing head and neck injuries in sports, and in particular football. I am also here as a former collegiate football player myself. I went to Indiana University on a football scholarship, which was good and bad. I went there and had a concussion like Mr. Nowinski, a very significant concussion that erased about 2 to 3 weeks from my mind but it also forced me to quit football and apply to medical school. So I probably wouldn't be here if it weren't for that concussion.

Thirdly, I am here as a team neurosurgeon for the Pittsburgh Steelers, and I have been very, very honored and pleased to work with three Super Bowl coaches, Coach Charles Noll, Coach Bill Cowher and Coach Mike Tomlin, and I must say at no time in my 25 years of professional career with that sports organization have I ever felt any pressure, any coercion or any suggestion that I should modify my diagnostic or decision making for any particular individual.

I must challenge Dr. Culverhouse in that regard in suggesting or intimating that most college or most professional team doctors are in the pocket of the team owners or compromise their own scientific and their own medical integrity for the team. I don't think that is the case now. In days gone by, it may have—there may have been some of that. But at the present time, I would strongly dispute that.

In addition, I was challenged once by Coach Chuck Noll in 1990 when I told him that his starting quarterback could not go back to play against the Dallas Cowboys the next week because he had a concussion. And he asked me why can't he? I said well, the guidelines say such and such. He said who wrote the guidelines. And then basically he said look, Maroon, if you want me to keep an athlete out of football, I want objective data that you can show me indicating that there is something wrong with his cognitive ability.

It was at that point that I called Mark Lovell, a neuropsychologist. And we went into the medical literature and we designed a test subsequently called impact which measures concentration, the ability to focus and memory and also reaction time to 1/100ths of a second. Dan Rooney and Coach Noll then allowed us to do the whole Pittsburgh football team, and subsequently there have been over 75 papers written validating the test and confirming that it is a neurocognitive test that is baselined—the athletes are baselined before the season and, if there is a concussion,

retested to assess cognitive functions, which is an extremely important aspect that all of the panelists have spoken to at this point.

And fourthly, I am here on behalf or as part of the MTBI committee of the NFL. So I am here to tell you four things. Number one, concussions are serious problems. I know personally and they have the potential for long-term neurological damage. At the University of Pittsburgh, we see 150 athletes a week. I am going to say that again. 150 athletes a week with post-concussion syndrome. This is a very serious entity and one that we must work to prevent.

I am here also to tell you that prevention is essential. Hippocrates, the Father of Medicine, said that the first responsibility of a physician is to prevent illness. If that be impossible, to cure it. Unfortunately, we don't have any cures, as Mr. Nowinski said and Ann McKee, for this entity of post-traumatic problems.

Third, I am here to tell you that from my experience, the NFL is a model in concussion management. The things they are doing, and I will go into that in just a second, are exactly what should be passed on to youth football. Merril Hoge this morning, who I will say I personally, after evaluating Merril after his concussions, advised him to quit football based on his neurocognitive tests and his examination. I suggested, Merril, this is not good for your brain. And fortunately he listened. But as he said, there are 3 million youth athletes. There is 1.1 million high school athletes. There is 50,000 college athletes. All of these need to have the same protective, preventive measures in place that are used for our professional athletes.

And I would go farther than that and say that what Congressman Pascrell said this morning about our troops in Afghanistan and Iraq, they should have the same benefits as our NFL quarterbacks in terms of when they should return to combat.

Finally, what is the NFL doing? You have heard of the NFL committee that was formed 15 years ago. So they have not had their head in the sand. There has not been denial about the effects of concussion. They have published many papers and done research. They have also educated the players, the coaches, and the trainers on the significance of concussion, the long-term effects of concussion, and the dangers of concussion. That is not denial.

Number two, they have instituted mandatory neurocognitive testing. They have instituted strict return to play guidelines. They have penalties and fines for hits to the head and there is a whistleblower program. If any player feels that he is being coerced to going back prematurely following a concussion, he can call a hotline and immediately have assistance in this.

And fourth, there is continued research going on. I was so pleased today when the Commissioner stated that he is now—that the NFL is going to make a joint effort to participate in the CTE programs that are looking at this in terms of the research going on.

So I think in summary, I commend you, Mr. Chairman, and your Committee for bringing everyone together today in this meeting and also putting the national spotlight on this problem so that it can have a positive effect on the millions of kids who aren't playing professional football.

Thank you.

[The prepared statement of Mr. Maroon follows:]

PREPARED STATEMENT OF JOSEPH MAROON

REPORT TO CHAIRMAN CONYERS
RANKING MEMBER SMITH AND
MEMBERS OF THE CONGRESSIONAL JUDICIARY COMMITTEE

In 1992 Al Toon of the New York Jets was the first NFL player known to have retired because of post concussion syndrome. In 1993 Merrill Hoge of the Chicago Bears retired because of the same problem. In 1994 Commissioner Paul Tagliabue formed the Mild Traumatic Brain Injury (MTBI) Committee to gather data to answer the question if this was a new problem, a misdiagnosed or an unrecognized one.

The committee was composed of experts inside and outside the league. It was specifically charged to initiate and support independent scientific research to provide better understanding of the causes, diagnosis, treatment and prevention of concussion. The following is a brief summary of some of the scientific efforts of the committee.

Protection Against Concussion – Helmet Standards

The National Organizing Committee for Safety in Athletic Equipment (NOCSAE) in 1973 established standards for impact performance of football helmets. Certification for college players was in 1978 and high school players in 1980. By increasing the standards for head gear, marked reductions in injuries were observed after the voluntary adoption of these standards by helmet manufacturers. Little was known at the time about the manner in which helmets reduced or prevented concussions and the Committee initiated a series of research projects aimed at defining the biomechanics of concussive impacts in professional football.

The committee undertook a considerable amount of biomechanical research. This included video reconstruction and analysis of impacts, the development of new testing models and mathematical modeling—all of which led to a much greater understanding of the kinds of impacts that result in concussions. This data was published and shared with all helmet manufacturers and NOCSAE. It has resulted in improved helmets and better testing methodology.

II. Biomechanical testing

Using the cinematographic analysis of athletes who had experienced concussions and transposing this into hybrid 111 male dummies important observations were made. For one, those forces impacting the temporal and mandibular area and the side of the face mask resulted in the greatest risk of concussion.

This data was then compared with boxers striking head models. This resulted in determining that rotational acceleration of the brain in boxing and translational forces in football were most responsible for concussions. The translational forces in football were more prominent because the shell of the helmet allows the player's head to slide relative to another thus limiting head rotational acceleration. Finite element modeling showed that strains develop late, after the primary impact force, and focus their response at the midbrain. Thus, in concussive blows there is the complicated interaction of the head in the role of brain movement and deformation within the skull.

Also discovered was that NOCSAE standards used the head drop test to evaluate shock attenuating properties of the helmet. Serious head injury is

determined from the Severity Index (SI) but this standard does not fully address helmet performance in reducing the risk of concussion.

The impact data and the understanding of the biomechanics learned from analyzing concussive blows was shared with NOCSAE and helmet manufacturers and for the first time helmets were expressly designed to reduce the risk of concussion. This resulted in the Adams USA Pro Elite, the Riddell Revolution, the Xenith and the Schutt Sport Air Varsity Commander and DNA helmets as examples of head gear designed specifically using the new biomechanical information to reduce concussions.

The committee then had the older VSR-4 Riddell tested against the new helmets. This testing revealed that the newer helmets reduced concussion risks in collisions in the range of 10-20%. This is accomplished by using thicker and more energy absorbing padding on the side and the back of the helmets and around the ears.

Most importantly, studies are now underway comparing 13 helmets from 5 different manufacturers for their concussion prevention capacity. Each helmet is being evaluated by 23 different biomechanical tests derived from the data noted above. For the first time, in 2010, objective and comparative data will be presented to the teams, players, equipment managers and physicians so data-driven choices can be made in selecting appropriate head protection. It is expected that the effect of these improvements, as they spread to the 1.2 million high school and colleges athletes will be profound in concussion reduction. Also, it will stimulate manufacturers to do even better.

Injury Collection and Data Analysis

I. Prevalence of concussion

The Center for Disease Control and Prevention estimates that there are approximately 300,000 concussions per year in all sports. The National Athletic Trainer's Association estimates between 43,000-67,000 concussions among high school football players annually. Research suggests this may be higher because many symptoms go unreported. Quarterbacks, wide receivers, defensive backs and special team players on kicking units are most vulnerable. In the NFL approximately 49% of players with concussions return to play the same game and 97.1% return to play by day 9 post injury. 2.9% missed more than 9 days before returning to play. Only 9.3% experienced loss of consciousness as the result of a severe head impact. Thus, 9 out of 10 NFL athletes with concussive injuries do not lose consciousness. An extremely important observation since many outside the NFL still believe that the primary criterion for a concussion is loss of consciousness.

II. Repeat Concussions

The I Committee then looked at the incidence of repeated concussion from 1996 to 2001 prospectively collected and analyzed. Out of 887 athletes with concussions, 160 experienced repeat injuries with 51 experiencing 3 or more concussions during the same 6 year study period. Although 90% of NFL players return to play within one week, recurrent injury caused by increased vulnerability in the immediate post concussion period did not seem to be a factor in this study.

Specifically, there have been no reported cases of second impact syndrome in the history of the NFL. More recently, there have been reports of chronic traumatic encephalopathy in former NFL players. Although this is well recognized in boxers, the same clinical features including a combination of motor, speech and gait dysfunction along with cognitive and personality changes has not been reported in NFL players with repeated injury. The issue of CTE and other long term effects is one that deserves further study. The committee has met with leaders in this research and will continue to do so. We support this and other research designed to improve our knowledge and help doctors,, players, and others evaluate and reduce risk.

III. Post Concussion Syndrome

This refers to the post-traumatic symptom complex characterized by memory impairment, headache, difficulty with concentration, impaired reaction time and personality changes commonly seen after a concussion., Because of the concern for this entity the committee performed a critical analysis of the widely promoted guidelines for the evaluation and management of concussion in sports. This was a six year study. It was found that concussion severity was best determined retrospectively on the basis of how long it takes the player to become asymptomatic. The guidelines used in the past were not as reliable as thought.

IV. Neuropsychological Testing in Evaluating Concussion

With the recognition that attention, memory and cognitive processing speed abnormalities were prevalent in athletes with concussion, the NFL

Committee evaluated the ImPACT program—Immediate Post Concussion Assessment and Cognitive Testing. This consists of six neuropsychological tests designed to target different aspects of cognitive function, including attention, memory, processing speed and reaction time. When compared with high school athletes with concussions, it was seen that the NFL players returned to normal in a shorter time whereas high school athletes had residual difficulties in reaction time and memory longer than the professional athlete. In 2007 neuropsychological baseline testing was mandated for all NFL teams.

V. Return to Play

Data analysis was undertaken concerning concussed athletes from the period 1996 – 2001 and compared with more recent 2002-2006 documented injuries.

- This study revealed a decrease in injury rate in the more recent study by 7.6% per team game.
- A statistically significant reduction of athletes that return to play in the same game (8.4% v 16.1%).
- A statistically significant increase in the number of cases that are classified as removed from play in that game (50.7% v 44.0%).
- The more recent study from 2002-2006 had a larger proportion of cases out 7+ days (16.7 v 8.2%) even though the signs and symptoms of the concussions were identical between the two study periods.
- The incidence of concussions in the NFL was determined to be 2 in every 5 games.

NFL Retired Players Study

In 2007 the NFL funded a research study to investigate the potential long term cognitive affects of professional football participation. This study is underway and will include a cohort of NFL players who have played at least four years in the NFL matched against a group of football players who have played college and no more than one year of professional football. Extensive studies include a baseline neurological and complete medical examination, neurocognitive testing, neuroimaging to include brain MRIs and evaluation of various blood components. When completed we hope that this study will contribute to the ongoing efforts to understand the incidence and extent of cognitive deficits from prolonged football participation and how we can better prevent those effects in current and future players

Additional Action by the NFL

As a result of the intensive research efforts and by constructively utilizing these observations , the NFL has initiated 1) educational and preventive measures, 2) guidelines for management of concussions and 3) specific rule changes.

Educationally major steps have been taken to educate the players, trainers, coaches and team physicians about the definition and implications of cerebral concussion. Specific symptoms and risks have been outlined and distributed to all NFL players in pamphlet form and through direct education by athletic trainers and team physicians. It is recognized that returning to play before symptoms have completely subsided is a risk factor for future injury. This

has been conveyed to all in the league and specific management and preventive guidelines have been instituted.

Specifically, neurocognitive testing is now mandatory as a preseason baseline and within 24-48 hours following a diagnosed cerebral concussion.

Further preventive measures include penalties and fines for helmet to helmet contact and blows to the head. Recently a whistle blower system with a toll free hotline was instituted to guard against players being pressured or forced into playing while hurt or returning too soon.

In summary, since the formation of the Committee by the NFL in 1994 the findings and analysis of research undertaken by the committee has led to major changes in the prevention and management of cerebral concussion. Ongoing studies hopefully will lead to even more effective preventive measures in the future.

APPENDIX A

Concussive Episode

Disruption of brain function

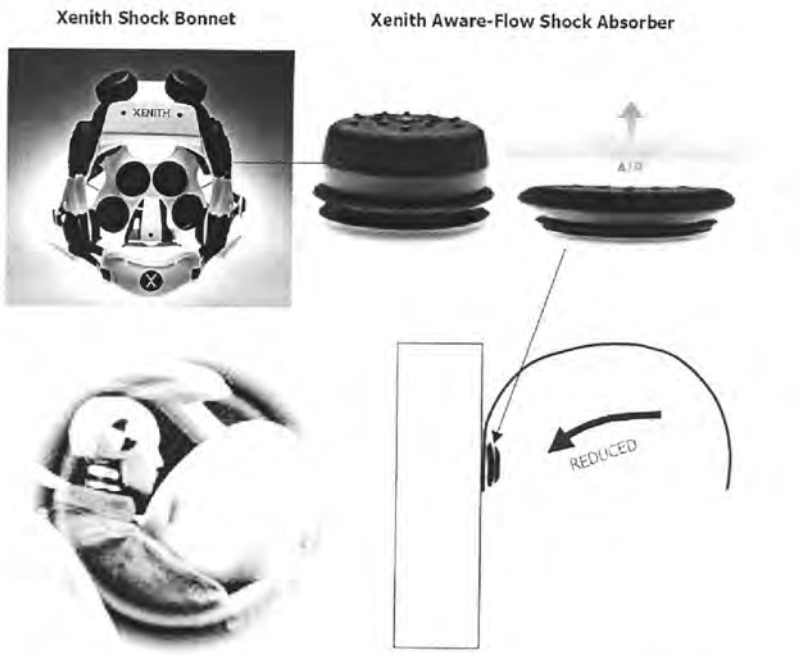
Results from sudden movement of the head

Force = Potential for Damage

Force = Mass * Acceleration

Force = Mass * (Change in Velocity)
TIME

MORE TIME=LOWER RISK =LOWER magnitude of acceleration and force	**LESS TIME=HIGHER RISK** =HIGHER magnitude of acceleration and force



The Xenith Shock Bonnet is a suspension of Aware-Flow Shock Absorbers, which function like automotive air bags. Aware-Flow Shock Absorbers collapse over a prolonged period of time, which minimizes the sudden movement of the head during impact. Aware-Flow Shock Absorbers adapt to impact in order to function over a wide energy range; they refill instantaneously, function over a wide temperature range, and show outstanding multi-impact durability.

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Mr. CONYERS. We are indebted to you. And we look forward to our discussion as soon as we finish up with Dr. Julian Bailes, Chairman of the University of West Virginia Medical School's Department of Neurosurgery. During his career, he was a finalist in the National Association of Emergency Medical Physicians' Cerebral Resuscitation Program Competition and has been awarded the West Virginia School of Medicine Dean's Excellence Award for his work there. He has received research grants that nearly reach $27 million in amount and has investigated head injuries in numerous football players, has publications, several that are mentioned here that will be put in the record.

Thank you, Dr. Bailes, for joining us. We appreciate your patience.

TESTIMONY OF JULIAN BAILES, M.D., CHAIRMAN, DEPARTMENT OF NEUROSURGERY, WEST VIRGINIA UNIVERSITY SCHOOL OF MEDICINE

Dr. BAILES. Good afternoon, Chairman Conyers and Ranking Member Smith and Members of the Committee, And I appreciate being able to meet with you.

My background is as a former player for 10 years, a sideline physician at the NFL or NCAA Division I level for the last 20 years, a neurosurgeon who runs the neurological service of a busy Level I trauma center, and as a laboratory researcher using models of concussion. I am also the father of five children, and I will say up front that I think football is the greatest sport in America and it is the one that I love the most.

I have worked extensively at the Brain Injury Research Institute with Dr. Bennet Omalu, the neuropathologist who first discovered CTE in the former Hall of Famer, Mike Webster, in 2002.

My current position, as you said, is Professor and Chairman at West Virginia University Department of Neurosurgery. In 2000, Frank Woschitz, who was the Executive Director of the NFLPA retired players, asked me to set up a center to study the health of retired players, which we did. We put it at the University of North Carolina Chapel Hill. I remain the Medical Director, Kevin Guskiewicz is the Center Director. And we looked at all sorts of health issues of retired players. We found expected incidence of heart problems and aches and pains and spinal problems and arthritis. But what surprised us way back then was out of this big funnel of data came the issue that these guys were cognitively impaired, the mental problems they were having. And that was way more than we expected or that you would expect for the population age-matched controls. The only risk factor we found for them having CTE—we analyzed all of their past medical history—was three or more concussions and if they had had three or more concussions during their career, they had a five times increased chance of having been diagnosed with cognitive impairment. Cognitive impairment is not good, because within a decade the vast majority of those people go on to being diagnosed as having Alzheimer's disease.

We published that 4 years ago. So that has been out there. Two years ago we published a second study that said once again if you have three or more concussions you had a triple incidence of having

depression diagnosed when you were retired. So both of these, cognitive impairment and depression, obviously are not good.

We continue our work there. We in fact have a study currently of retired players with great detail, the MRI scans, the neuropsychological testing and others, and we expect that study to be completed next spring.

We were in 2000 and we remain today the only entity, the only center that was ever envisioned to study the health of players once they retire. With special standing methods used for detecting Alzheimer's disease, Dr. Omalu and I have gone on to examine the brains of 17 modern contact sport athletes.

As you can see from the slide, a normal brain on the left and on the right, a slide of the first case of CTE, the great Steeler center, Mike Webster, who played 17 years, you can see the brown spots, similar to what was shown before with—representing dead neurons, this tau protein, it is in a way sort of like sludge which clogs up the brain cell, the neuron. It can't clear it. It is portions of this dead protein in the brain cells and their connections. In every case, where similar behavioral or psychological problems, such as personality changes, memory loss, business and personal failures, depression and suicide, we found extensive areas of tauopathy, which is the abnormal collection of tau protein.

Many continue to say we are going to keep studying this, we are going to keep after it. However, it is my scientific and medical opinion that we now have enough indisputable research from examination of the brains of dead players to the lives of retired players that confirms the reality of CTE. Unless changes occur, further injuries will happen in professional football players, all the way down to all levels of play.

And we heard today a lot about a lot of changes that have been made and are going to be made, and I think that is great.

I believe also that the velocity of the head impacts today in football are one of the biggest differences. The velocity of the hits and the hits to the head are a big, big part of the problem.

I also think there is an emerging concept of subconcussive injuries. In other words, all of our energy and all of our work has been toward the diagnosing the player who had concussion. What about the players—and we have autopsied several linemen, none of them who had a history of concussion—who had extensive tau protein deposition and all died with a clinical syndrome of CTE, behavioral and psychological problems. So I think that subconcussive blows, undiagnosed concussions is more a problem than previously appreciated.

I would like to conclude by saying that obviously concussion is a complex issue. In response to Dr. Culverhouse's comments, I will tell you that 20 years at the NFL level with the Rooney family and the Steelers and Coach Chuck Noll and Coach Bill Cowher and 10 years at the NCA Division Level I level, I never had one occasion of a coach or anyone else trying to influence my medical decision. So I respectfully disagree. I don't really think that is where the problem lies. I think the problem lies in maybe improving rules, always trying to improve helmets and realizing about velocity. I am here today to try to keep the game alive by making it safer.

Thank you again for allowing me to speak, and I will be glad to answer any questions.

[The prepared statement of Dr. Bailes follows:]

PREPARED STATEMENT OF JULIAN BAILES

BRAIN INJURY
RESEARCH INSTITUTE

Testimony of

Julian Bailes, M.D.
Chairman of the Department of Neurosurgery at
West Virginia University School of Medicine

Before the
House Committee on the Judiciary

"Legal Issues Relating to Football Head Injuries"

October 28, 2009

Good afternoon Chairman Conyers, Ranking Member Smith, and members of the Committee.

I come to you today with the following background: a former football player-10 years including junior high school, high school, and at the collegiate level, as a sideline team physician at the NFL or NCAA Division I levels for the last 20 years, as a neurosurgeon who runs the neurological service of a busy Level I Trauma Center, a researcher both in the laboratory with models of concussion, and its effects in humans, in the expression both while living and by autopsy analysis of their brains. I am also the father of five children. I believe that football is America's greatest sport and one which I love the most. My current position is Professor and Chairman of the Department of Neurosurgery at West Virginia University School of Medicine.

To me, there are three areas of concern for concussion in contact sports, particularly football, in America today. The first is the early and accurate detection of the presence of concussion and its appropriate and *conservative* management. The second is interdiction so that the deleterious effects on brain function are not felt at that time, in that season, to the detriment of the athletes' subsequent play, their ability to learn and perform scholastically, and on their general quality of life. The third area is to do everything in our power to understand and thus ultimately prevent, the possibility of the athlete developing a chronic brain injury due to multiple, diagnosed or not, cerebral concussions. This includes the syndrome of chronic traumatic encephalopathy or CTE.

In 2000, with funding and encouragement by the NFL Players' Association, and its Executive Director, Frank Woschitz, I, along with Dr. Kevin Guskiewicz, established the Center for Study of Retired Athletes, which has been in operation since that time and is located at the University of North Carolina, Chapel Hill. I remain the Medical Director.

Using funding provided by the NFLPA, we set out to study the health of about retired NFL players. Our studies showed two major conclusions, both published as independent scientific

papers in peer-reviewed, distinguished medical journals. The findings of our first study were an amount of joint, spinal, cardiovascular and other health issues as we would expect in these age groups and with their football exposure. However, to our surprise, the most unusual finding we noted was the high incidence of cognitive or psychological problems in these retirees. Using a general health questionnaire, 2,552 retired NFL players with an average age of 54 years and average football playing career of 6.6 years, this survey research identified by statistical analysis an association between recurrent or multiple concussions and memory impairments. That is, that retired NFL players who had mild cognitive impairment (MCI) were not only a higher number than found in the general population, but the only known risk factor they had was if they had sustained 3 or more concussions during their NFL playing days. If so, they had a five times increased chance of having MCI. This impairment of mental functioning has a terrible prognosis, since the vast majority of them will go on to develop Alzheimer's Disease within a decade.

Our second published study showed a higher incidence of retirees being diagnosed as having depression, 11% which greatly exceeds the incidence in age-matched general population. The only risk factor was, once again, a history of 3 or more concussions during their career, which conferred a triple-incidence of that diagnosis of depression. Therefore, this research has shown that there appears to be a threshold number, in our findings 3 concussions, where the incidence begins to appear for future problems with mental and psychological function. Regardless if it is 3 or another number of concussions, I believe that there is a threshold exposure to documented, significant concussions whereby the risk for long term problems accrues. A current study at the CSRA under the direction of Dr. Guskiewicz is undertaking a detailed analysis using special MRI scans, neurological, and neuropsychological testing concerning the brain functioning of retired players.

I have also worked extensively with Bennet Omalu, M.D., the neuropathologist who first diagnosed in 2002 the condition of CTE in the Hall of Fame NFL player Mike Webster. We began as a West Virginia- based brain injury group, now known as the Brain Injury Research Institute

based at West Virginia University. We are now operating under a Memorandum of Understanding with the Blanchette Rockefeller Neuroscience Institute. With special brain tissue staining methods used for detecting Alzheimer's Disease, we have gone on the examine the brains of 17 modern contact sport athletes. In every case where there were similar behavioral or psychological problems, such as personality changes, memory loss, business and personal failures, depression, and suicide, we have found extensive areas of tauopathy. This is the abnormal collection of Tau protein, indicating areas of dead brain cells, neurons, and their connections.

Our research has led us to better understand and classify the types of CTE and the areas of brain which are most commonly involved. We also have conducted research into the behavioral and emotional spectrum, the areas of the brain which control these functions, and the potential effects of substances of abuse, anabolic steroids, and other potential mitigating or contributing factors. In addition, we have found important trends in the genetic profiles of individuals affected with CTE, raising the possibility that in the future prediction of risk may allow for greater prevention in those potentially exposed.

In the laboratory, I have directed research which has investigated numerous structural, cellular, and behavioral changes in the brain resultant from concussive injury. Modern models of concussion create highly quantifiable and reproducible injuries which can be used to measure the effects of potential treatment for mild traumatic brain injury. It is our hope that one day, a dietary supplement or pharmaceutical could lessen or prevent the injury to neurons and their connections, or facilitate the brain's own attempts to repair these injured areas, or perhaps block the formation of tau protein deposits.

In my opinion, the sport of football, which I love and greatly desire to see as a viable and important sport in our country, needs to consider additional ways in which the game could be made safer. Many continue to say, "we're gonna keep studying this". However, it is my scientific and medical opinion that we now have enough indisputable research-from

examination of the brains of deceased athletes and the lives of retired players-to confirm the reality of CTE.

I believe that the phenomenon of sub-concussive blows, has been previously unknown or underappreciated, has an incompletely understood role but one of increasing importance. I believe that we should focus upon the velocity of the impacts, because to me that is the single biggest change in the sport which has led to increasingly violent collisions which likely are not going to decrease, and which also, at the highest impact levels, exceed the ability of current protective equipment and human brain tolerance. I am here today to try to keep the game alive by making it safer. Thank you for allowing me to speak with you and I will be pleased to answer any questions.

Mr. CONYERS. We appreciate your conclusions and your analysis. You bring a lot of experience here.

Dr. Joel Morgenlander, from Duke University, Professor of Neurology, runs the Clinical Neurology Service at Duke and is Medical Director of the Neuroscience Clinical Service Unit at Duke Hospital, and he is also connected with the committee that works with the National Football League on this same subject.

We welcome you, and we appreciate your patience with us. It has been a long day. But I think it has been more than worthwhile, I can say on behalf of the Members of the Committee, for all of you to give us this very invaluable time.

TESTIMONY OF JOEL MORGENLANDER, M.D., PROFESSOR OF NEUROLOGY, DUKE UNIVERSITY MEDICAL CENTER

Dr. MORGENLANDER. Thank you, Chairman Conyers, Members of the Committee.

I was contacted 3 years ago by Dr. Tom Mayer, the Medical Director of the NFL Players Association. I was asked to consider joining the Mild Traumatic Brain Injury Committee of the NFL. At that time, Dr. Elliott Pellman was the Chair of the MTBI Committee. I was very clear with Dr. Pellman from the beginning that I was interested in helping with the committee's work on player safety as long as I was convinced the committee was going to take my ideas and concerns seriously. I am a neurologist and to my way of thinking, all concussions are to be avoided. I wanted Dr. Pellman to understand my vantage point.

The MTBI Committee is compromised of team physicians, trainers, an engineer, a statistician, neurosurgeons, a neuroradiologist, a neuropsychologist, neurologist, and NFL and NFLPA representatives. I feel it is important for the Members of the Judiciary Committee to hear that in my 3 years that I participated in this work, I feel that all of my ideas and those of other committee members have been heard and discussed fairly.

The support for our work goes past the MTBI Committee to the Commissioner's office. I have been privy to no hidden agenda during my work with the MTBI Committee. Those that I have worked with are focused on player safety. Our hope is that lessons learned will help with injuries beyond the realm of professional football, but the NFL players are a central concern.

The issues of the MTBI Committee's work include injury prevention, player and medical personnel education, return to play decisions, and evaluations of late effects of concussion. During the years I have been on the committee, we have communicated directly with players and families about the symptoms of concussion to try and facilitate understanding on their part.

We have held several conferences with leaders in the field of head injury and sports concussion, including the Department of Defense, to share ideas and better understand opportunities for future research. With the Commissioner's support, we instituted a rule to not return any player with loss of consciousness to the same game. Each team is now required to have a neuropsychology consultant and baseline cognitive testing for each player.

We continue to work with manufacturers of helmets and other equipment on improvements targeted at player safety. We have

much more to do, but I believe we are making a difference. As physicians, we strive to use the highest level of medical evidence when making evaluation and treatment recommendations.

Unfortunately, in my opinion, the area of sports concussion is behind in many areas in neurology in the amount of prospective data on injury and recovery. Retrospective data is never as reliable as prospective results and associations do not prove causation. Therefore, at this time it is not possible to specifically determine the long-term risks of a single or repeated concussion.

For the return of play decision, it is recommended that the player be asymptomatic both at rest and with exercise. As you have heard, the medical evaluation rests partly on the player's report. NFL team concussion data has shown that over the past several years, more players with concussion are not returning to play on the same day.

Our committee has worked with team physicians and trainers to update our concussion report forms for the purposes of improving data collection and looking for clinical keys to player outcomes. Members of the MTBI Committee are concerned about reports of pathologic brain findings in retired NFL players and other athletes as well as nonathletes who have sustained multiple head injuries.

The syndrome term, chronic traumatic encephalopathy, or CTE, as you have heard, appears to be pathologically different from other neurodegenerative diseases. In my conversations with the NFL players, it has become clear to me that nearly all of them have had concussions at some point in their careers. This includes concussions occurring during high school, college, and professional football.

If the majority of players sustain concussions during their career, then why are only certain players affected with CTE? The majority of players lead cognitively normal lives after football. So what is different about these subjects that predisposed them to additional risk? We know that from Alzheimer's disease literature, genetics factors interact with environmental factors to advance cognitive decline in some patients. We do not know the effects of other medical factors, including illness and exposures that might have an impact on this repeated head injury.

We now hear reports of high school and college athletes with pathologic changes of the brain consistent with CTE. Might there be a particular age at injury that predisposes the player to these late effects?

All of these questions are very important and need to be sorted out in order to determine the actual risk of brain injury from contact sports for those who choose to participate.

In one attempt to get more information, the MTBI Committee and the NFL have sponsored the retired players study you have been talking about. This study is an attempt to gain more information about middle aged retired players, comparing players with different NFL career duration. We are including past medical history and player examinations with state-of-the-art Magnetic Resonance Imaging studies, genetic screening and neuropsychological testing. These tests have normative data by age to compare to.

Neuroradiology and neuropsychology consultants, independent of the MTBI Committee, have been involved in this study both from

design data analysis and will be involved in the publication. We hope data from this study will add further information concerning the risk to players and help improve future player evaluation and testing. I personally feel that this neuropathologic work you have been hearing about is important and know that those involved plan to continue.

Players with no history of cognitive complaints are currently being recruited as controls and that will be important. Future prospective studies following a cohort of young players may be particularly helpful. These studies should include medical and concussion histories, neuropsychological evaluations and neuroimaging studies. Many researchers are interested in these areas concerning sports concussion and more precise information should be forthcoming.

I hope that my testimony has been helpful to the Committee, and I will be happy to answer any questions you may have.

[The prepared statement of Dr. Morgenlander follows:]

PREPARED STATEMENT OF JOEL MORGENLANDER

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Joel Morgenlander, M.D.

Professor of Neurology, Duke University Medical Center

Member, Mild Traumatic Brain Injury Committee of the National Football League

10/28/09

"Legal Issues Relating to Football Head Injuries"

Congress of the United States

House of Representatives, Committee on the Judiciary

Members of the United States House Judiciary Committee

Thank you for inviting me to testify today concerning issues related to concussion and the NFL. My name is Dr. Joel Morgenlander. I am a Professor of Neurology at Duke University Medical Center, where I run the Clinical Neurology Service and the Neurology Residency Training Program.

I was contacted three years ago by Dr. Thom Mayer, the medical director of the NFL Player's Association (NFLPA) and was asked to consider joining the Mild Traumatic Brain Injury (MTBI) Committee of the NFL. At that time, Dr. Elliott Pellman was the chair of the MTBI Committee. I was very clear with Dr. Pellman from the beginning that I was interested in helping with the Committee's work on player safety as long as I was convinced that the Committee was going to take my ideas and concerns seriously. I am a neurologist, and, to my way of thinking, all concussions are to be avoided. I wanted Dr. Pellman to understand my vantage point. The MTBI Committee is

comprised of team physicians, trainers, an engineer, a statistician, neurosurgeons, a neuro-radiologist, a neuro-psychologist, neurologists, and NFL and NFLPA representatives. It is important for the Members of the Judiciary Committee to hear that in the three years I have participated in this work, I feel that all of my ideas and those of other Committee members have been heard and discussed fairly. The support for our work goes past the MTBI Committee to the Commissioner's office. I have been privy to no hidden agenda during my work with the MTBI Committee. Those that I have worked with are focused on player safety. Our hope is that the lessons learned will help with injuries beyond the realm of professional football, but the NFL players are our central concern.

The issues of the MTBI Committee's work include injury prevention, player and medical personnel education, return-to-play decisions, and the evaluation of late effects of concussion. During the years I have been on the committee, we have communicated directly with players and families about the symptoms of concussion to try to facilitate understanding on their part. We have held several conferences with leaders in the field of head injury and sports concussion, including the Department of Defense, to share ideas and better understand opportunities for future research. With the Commissioner's support, we instituted a rule to not return any player with loss of consciousness to the same game. Each team is now required to have a neuro-psychology consultant and baseline cognitive testing for each player. We continue to work with manufacturers of helmets and other equipment on improvements targeted at player safety. We have much more to do, but I believe we are making a difference.

As physicians, we strive to use the highest level of medical evidence when making evaluation and treatment recommendations. Unfortunately, in my opinion, the area of sports concussion is behind many areas in neurology in the amount of prospective data on injury and recovery. Retrospective data is never as reliable as prospective results and associations do not prove causation. Therefore, at this time, it is not possible to specifically determine the long term risk of a single or repeated concussion.

For the return-to-play decision, it is recommended that the player be asymptomatic both at rest and with exercise. This medical evaluation rests partly on the player's report. NFL team concussion data has shown that over the past several years, more players with concussion are not returning to play on the same day. Our committee has worked with the team physicians and trainers to update our concussion report forms for the purposes of improving data collection and looking for clinical keys to player outcomes.

Members of the MTBI Committee are concerned about reports of pathological brain findings in retired NFL players and other athletes as well as non-athletes who have sustained multiple head injuries. The syndrome termed Chronic Traumatic Encephalopathy (CTE) appears to be pathologically different from other neuro-degenerative diseases. In my conversations with the NFL players, it became clear to me that nearly all of them have had concussions. This includes concussions occurring during high school, college and professional football. If the majority of players sustain concussions during their career, why are only certain players affected? The majority of players lead cognitively normal lives after football, so what is different about these

subjects that predispose them to additional risk? We know from the Alzheimer disease literature that genetic factors interact with environmental factors to advance cognitive decline. We do not know the effects other medical factors, including illness and exposures, may have in the setting of repeated head injury. We now hear reports of high school and college athletes with pathological changes of the brain consistent with CTE. Might there be a particular age at injury that predisposes the player to these late effects? All of these questions need to be sorted out in order to determine the actual risk of brain injury from contact sports for those who choose to participate.

In one attempt to get more information, the MTBI Committee and the NFL have sponsored the Retired Players Study. This study is an attempt to gain more information about the middle aged retired players, comparing players with different NFL career duration. We are including past medical history and player examinations with state of the art magnetic resonance imaging studies, genetic screening, and neuro-psychological testing. These tests have normative data by age. Neuro-radiology and neuro-psychology consultants independent from the MTBI Committee have been involved in the study design, data analysis, and will be involved in the publication. We hope data from this study will add further information concerning the risk to players and help improve future player evaluation and testing.

I personally feel that this neuro-pathological work is important and know that those involved plan to continue. Players with no history of cognitive complaints are currently being recruited as controls. Future prospective studies following a cohort of young players may be particularly helpful. These studies should include medical and

concussion histories, neuro-psychological evaluations, and neuro-imaging. Many researchers are interested in these issues concerning sports concussion and more precise information will be forthcoming.

I hope that my testimony has been helpful to the House Judiciary Committee. I will be happy to answer any questions you may have.

Mr. CONYERS. It has been very helpful. All of your testimonies have left us with a whole new and important perspective. And, Mr. Dick Benson, I would like you to think along with me about two considerations that leave me to discuss with everybody here.

The first is what Dr. Maroon described so eloquently is very important, except for the fact that many of, if not most of, the high school, middle school kids that are in football don't have the kind of people around with the talent and medical expertise to accomplish the excellent kind of results that he has reported. Pro football—well, I am assuming pro football does, but I don't even do that with any sincere degree of certainty. But I know when you go down and when you get out into the little leaguers where they don't have an orthopedic surgeon who doesn't know concussion if it hit him in the face. They don't have anybody. They don't have any—they don't even have a doctor of any kind. They trained—they trained parents at the school about—they give them a few things about health.

So there is one problem, isn't it? And I want you to talk with me about it. But I want to get the other one out so that we can all talk about this together.

The other question is that I find that I have had a little experience listening. I am disturbed that Dr. Gay Culverhouse seems to be the only one that sees something that many people have commented critically on. Now, is it that she doesn't have any experience about football or she is not—well, to put it in a more colloquial way, Mr. Barber, what is your problem? Where does she—how does she get so distraught about something that nobody else can put a finger on?

What does that tell the Chairman of this Committee? Well, one thing it could tell me, Mr. Benson, is that she may be on to something that nobody else wants to break the news to all of us Federal legislators, and I want to now yield to Mr. Benson and Mr. Nowinski to help me feel better as this thing comes to an end. Maybe we can rationalize this away a little bit better.

Mr. BENSON. Mr. Chairman, it is obviously true that the younger players and younger leagues don't have adequate medical care, and I would argue that is mostly true through high school in Texas, because until the passage of Will's Bill there is no requirement that the team doctors, whether they are an orthopedist, a psychiatrist, a dentist or whatever willing volunteer, actually catch up and learn the technology of the injuries that are potentially catastrophic. That is what we are looking at.

The purpose of Will's Bill was to try to cut back and deal with and treat catastrophic injuries, those that cause death, permanent or long-term disability. I personally—I am not enthusiastic about very young football leagues. I think maybe it is a lot of fun for the kids when you turn a blind eye to the potential cost and you turn a blind eye to the fact that they are more susceptible to concussion and less likely to report it and, as I understand it, experience the conditions longer. I don't like that. I wouldn't let my children engage in that league, not anymore.

Mr. NOWINSKI. Thank you for the question, Mr. Chairman. I will answer the second one first in terms of Dr. Culverhouse.

I do believe the stories that Dr. Maroon—I think he is a great guy and I am guessing the Steelers have been fine for a while. But I will tell you that I know of plenty of stories of guys who have been mistreated and a lot of those guys coming forward and telling their stories has created the awareness that we have.

I will give you one example, is Ted Johnson. Ted Johnson is a middle linebacker for the Patriots for 10 years. A few years ago he got a concussion in a preseason game, 2 days later showed up to practice, had not seen a doctor, should not have been able to practice. And in the middle—when he had—in the middle of practice, he had a noncontact jersey on and an assistant came up and said put this full-contact jersey on and Coach Belichick wants you back in the game. No medical person intervened. They allowed him to go back into the practice. He took another concussion on the next play and that pretty much derailed his career, derailed his life. He retired from concussions and he is not the same guy he was.

That was a very obvious example of mismanaged medicine.

Kyle Turley, if he was here today, just retired last year in the Pro Bowl, has been telling stories left and right of times when he was mistreated by the teams he played for, had a bad concussion, locked in a room and left there unchecked for hours.

My best friend and roommate from college, Isaiah Kacyvenski, played 8 years in the league. Team to team is very different. He was with the Seahawks at first and couldn't speak well enough for how well they did it. Went to other teams and spoke of a time he got concussed, was on the sidelines and they had a neural expert but he was up in the sky box. The other doctor tried to examine him. He couldn't smell the smelling salts. He couldn't see straight and they were trying to tell him to go back in. And it wasn't until the neuro guy got all the way down from 10 floors above and said that is crazy, you can't put him back in.

So there are definitely holes in the system, and the players would be happy to tell you themselves, and most of them are on the record with it.

In terms of the youth issue, I think you are absolutely right. There is something very strange about not telling the kids or the coaches about one of the most common injuries they can get in football and the most serious one. The idea that we are willing to put a helmet on a kid and tell him to run into his friends a thousand times every fall but not tell him to look out for this, not tell him how to look out for concussions or tell him how to take care of it and not tell the only adult there, the coach how to do it, and not providing medical staff seems to me to be a mistake.

Mr. CONYERS. Before I turn to Bob Goodlatte, could any of you weigh in on my final two questions? Anybody else have a thought about this? Please make me feel better as we bring this hearing to an end.

Dr. MAROON. I think in the past, as I think Bob Cantu this morning, one of the speakers this morning said, that his management of concussions and the management of injuries in the last 5 to 10 years is clearly different from the way we managed injuries before. And I think that I am—in terms of the comments of Dr. Culverhouse, I think that clearly in the 1970's and the 1980's and the 1960's, the culture was very different. And what I am seeing

now is a major culture change and a culture shift in the appreciation of the players as well as the administrating physicians and trainers in the handling of injuries.

Clearly there have been errors in the past in judgment. But I think as Chris said, there are holes in the system. But it is our responsibility to try to patch those holes as quickly as possible for the benefit of the athletes.

Mr. CONYERS. Bob Goodlatte.

Mr. GOODLATTE. Thank you, Mr. Chairman. Mr. Chairman, I want to thank you for holding this hearing. This is not an ordinary topic for the Judiciary Committee to cover, but it has certainly been a very enlightening one for all of us who have participated, and I must say that it is my hope that those people who are able to view this on the streaming, on the Internet, or perhaps this will be rebroadcast on C-SPAN, that if there are just some parents who see this and hear this they will be better informed, either to be better informed about decisions made by their children, whether or not they play football, but also more importantly many of them are going to decide to play football and they can advocate for better conditions under which they do play.

I have the greatest concern for those young people. Obviously I am concerned about anybody who sustains the kind of concussions that we have talked about here today and the life impairing injuries that they could sustain.

Mr. Benson, I think you have done it the right way in getting that passed through the Texas legislature. I am very concerned about this, but I have to say that given the considerations of the Commerce Clause of the U.S. Constitution, it would be difficult, I think, for the Congress to extend the long arm of the Federal Government down to high school football games and be able to enact the kind of regulations that you and Mr. Hoge and Mr. Barber and others have referred to here. But the awareness that you brought that we have been able to facilitate here I think is a good thing.

And I would like to ask, Mr. Barber, who I am delighted is here. He has excited a lot of fans in my hometown of Roanoke, Virginia, playing for Cave Spring High School and subsequently for the University of Virginia and then of course the New York Giants. And I would like to ask Dr. Maroon as a team physician, and maybe Dr. Bailes as well.

This problem at the NFL level, you have a multi-billion dollar industry, players with multi-million dollar contracts, fans that pay hundreds of dollars for a ticket to see the game in person or watch it on TV in the hundreds of millions and we all know what an ad goes for for 30 seconds on the Super Bowl. So there are lots of resources available to address this.

Is the risk reduced by that or is it just as great because while you have more equipment and better physicians on the ground, you also have stronger, faster, more aggressive—I mean, you are playing at the very top of this game. And is that more likely to result in those kinds of concussions? Or is the risk greater for high school and college teams that don't have those same resources, obviously especially at the high school level, and are faced with making a different set of decisions? Is the problem the same or is it different at the high school level and at the professional level?

Mr. BARBER. I appreciate the question, Mr. Goodlatte, and I will answer this in two ways. I think on the high school level the danger is because of ill-fitting helmets. It is a lot of hand-me-down things that aren't specifically structured for a young athlete's head. It is whatever is in the bin. In the NFL, things get a little bit better because they are custom made.

We have to remember that helmets were originally made to prevent skull fractures. We used to play with leather helmets. But when people started hitting each other very hard skulls were cracking, and so the original designs of helmets were not to protect us from concussions. It was to prevent our brains from cracking open.

I think on a more important issue, it is about people, it is about the individuals who play the games. And what I mean by that is from a very young age, if you are an athlete, a star athlete, you are ushered along, you are fed meals, you are taken care of medically, so that when you get to the point in college and high school, you almost don't know how to think for yourself, and so the empowerment of individuals to know their own bodies, to be able to make their own decisions I think is the most paramount thing that we need to focus on.

As I mentioned earlier, when you get a concussion, as I did in 1997, and you break your arm as I did in 2000, and ultimately decided to play in both cases, it was my informed decision to do so with the input from my doctors, with the input from my training staff, with the input from my coaches. I felt like I was capable of doing it because I was informed.

A lot of athletes are not informed because they just listen to what is told them. If there is one thing that I could change and empower and inform fellow athletes, it is to learn yourself. Don't trust what everybody else tells you. Learn it yourself.

Mr. GOODLATTE. Thank you. Dr. Maroon.

Dr. MAROON. Thank you. That was an excellent question, sir, from a couple of different viewpoints. You started with the financial aspect of it and relative to high schools versus the professional team, and Tiki had a very excellent point that the testing requirements up until recently have been to prevent the fatal head injuries and the penetrating experiences through the skull and the head to protect the outer shell. Recently, the NFL has and presently, actually ongoing, is evaluating five different helmet manufacturers and their helmets. In other words, in the past, if you go to the equipment manager of the Pittsburgh Steelers, the various companies will come in and make assertions that my helmet is better than this helmet, is better than that helmet, and can reduce concussions by X percentage with no good data out there to substantiate that. So what the NFL has done, they invited all helmet manufacturers to submit models of their helmets for 23 separate individual tests that have evolved from the video analysis done by—on the research that has been ongoing with the NFL, and these helmets are being tested now for their ability to prevent the subconcussive blows and the concussions. Not necessarily fatal injury, but what are we doing to prevent subconcussive blows in helmet design.

Well, we really are making progress in that area. And very many concepts—Dr. Bailes mentioned that—the formula of force is equal

to mass times acceleration. In the NFL and in college and high school, we have massive—big masses, as you know, 300, 350-pound individuals going at a very fast speed, high velocity. Mass times velocity equals force. So there is much more force.

But if you ask what is acceleration, it is the delta, the change in velocity over time. So if you are driving home on the Washington Parkway and you come to a bifurcation in the road, instead of hitting the coffin corner with no—with a concrete embankment, you know the Highway Department now has telescopic compressible water filled cushions that absorb the velocity. It takes longer, the time is increased, thus reducing the velocity and reducing the force.

So this kind of new helmet technology that is evolving is actually here. The problem of cost is definitely a significant one. These helmets are in the range of $300 a piece. The older helmets, which still 40 to 50 percent of NFL players use, are in the 160 to $180 range. So cost is a factor and how to bring that down at the high school level, I don't know.

Mr. GOODLATTE. Dr. Bailes.

Dr. BAILES. Yes, briefly. I think one way to look at it is the high schools and the lower levels of play have less everything. They have less education, they have less medical advice and attention, they have less numbers of athletic trainers, less good headgear, for instance. So I think they just have a lot less. They also have a brain that is probably more vulnerable at the younger age.

Now, the NFL, the issue there, you asked about that, is I believe they have much bigger and much faster players, as we have said. And they also have a much higher velocity of impact. Secondly, they have accrued more years of exposure. So I think that also is another factor.

So I think both at the highest levels and the lower levels, I think you have different factors at play.

Mr. GOODLATTE. The Chairman has indicated we are probably not going to do another round of questions. This is an excellent panel and he has given me leave to ask one more question. And I would like too direct it to Mr. Nowinski and Dr. McKee.

A lot of discussion, both from Members here and from some of the Members of the panel, analogizing the problem with head injuries in football to cigarette smoking and cancer. Obviously one big difference is that if you asked almost anybody on this panel on either side of the aisle, we would tell somebody who was considering smoking don't do it, period. End of discussion. Avoid all of the risks that are entailed therein.

On the other hand, I think if you asked most Members of this panel whether or not we should tell everybody not to play football, there would be maybe a much stronger on the other side saying, no, we are not going to tell people not to play football.

So given your concerns and what you have said, are you advocating, Mr. Nowinski, that people not play football? Where do you come down in trying to address this problem? Because obviously based upon what the two doctors said and what Mr. Barber said, the resources just aren't there to make this sport as safe as you or I would like to make it be for high school students, and yet it is something very popular not only with the players, but obviously with the large populations in almost every community in America.

Mr. NOWINSKI. I thank you for your question. I would like to begin by actually addressing your last question. There is another piece of data. In terms of the difference between high school and pro sports, there was a study that came out of the University of Illinois this summer that showed that the average force of the head of a high school player was actually higher per collision than a college player, who is 24 Gs to 22, with a theory being the high school players have weaker necks and they use their helmets more because they need to. They are not as strong. So the problem is really at the lower level.

So the question being should people be playing. The problem I had when I got in the situation I was in as a pro wrestler, and then as an adult, was I didn't know. I never had a choice in my outcome. So the fact that I had to deal with 5 years of headaches and depression and short-term memory problems and couldn't go back to work to any job for a couple of years, I was very frustrated by the fact that I didn't know any better and I could have prevented it.

So I think that goal number one is to make sure that every parent who signs up their kid to play football understands the risk. And I think goal number two is to make sure that everybody who plays understands the risk and also understands how to minimize it.

I do not want to see football go away. I still enjoy going back to Harvard football games every Saturday and rooting to beat Yale, which we always do now, which is great. And I don't want to—I don't want to see it go away. So what I do want to see, though, is this radical change, this whole idea of this 10-point plan. I don't think—if we are committed to assessing everything, putting everything on the table, saying look, these guys, these 11 brains we have looked at, the brains Dr. Bailes and this group have looked at, these are the canaries in the coal mine. This is showing that the game has evolved into something we didn't understand. It is nobody's fault, but it is something it shouldn't be. And if we don't put everything on the table and say let us change it, then I don't know—if the commitment doesn't show, then I don't know what to tell parents. I think they have to make up their own minds. But I want to see it changed first.

Mr. GOODLATTE. Dr. McKee.

Dr. MCKEE. I would agree with everything Mr. Nowinski has said. I do believe that the game can be changed. I too, believe it or not, am a huge football fan. But I think it can be changed. And I don't play football, so I wouldn't be able to elucidate all the different ways we would minimize the injury during the play of the game. But Chris has come up with a 10-point plan—reducing contact during practicing, reducing scrimmage. All those things I think we need to do and I think we need to do them immediately.

Football is an American sport. Everyone loves it. I certainly would never want to ban football. But I think we can play it smarter. There is a lot of risks associated with football and they may be very great for the young player. We maybe need to reconsider when kids start playing football and we need to consider what kind of support we are going to allow for the football to be played. I mean, do certain things have to be in place for football to take place at the high school level? And maybe that does mean that we can't

play football unless there are resources there to support it adequately.

And then in the case of the pro player, I think that of course football can go on but we need to adequately inform the players about their risks. We haven't banned cigarette smoking. People smoke. People make that choice. But they need to make an informed decision. They need to understand the risks and it needs to be out there if they want to pay attention to what those risks are.

Mr. GOODLATTE. I agree with your analysis, and I hope that we can make progress in finding ways to make football as safe as possible but still keep this very popular national pastime.

Mr. Chairman, thank you again. I have to say that I think that in terms of education, this has been a great hearing. I still feel that the Congress should not inject itself into the negotiations between the NFL and the NFL players. And I think that as this pertains to improving the safety of football, we can promote research and we can promote education. I think some of the tough decisions that have been advocated for have been made at the State and local level just because of how our system of government works.

Thank you very much for holding this hearing.

Mr. CONYERS. Thanks for those two excellent questions.

Bill Delahunt.

Mr. DELAHUNT. Thank you, Mr. Chairman. And I want to acknowledge the great work that is happening at the university in my hometown, Boston University. Professor Cantu, Chris is here and Professor—Dr. Ann McKee. I had posed a question to the first panel and no one had an answer. But I think the point that Bob Goodlatte made—or I think you made actually, Dr. McKee, that goes to the issue of the individual or in the case of those who have not attained majority, their parents should be well informed. And from my very cursory reading of the reality that often times indicia of problems occur decades later, is there—and it would appear that the protein, tau, is—as was shown on the slides earlier—is a red flag, and that seems to be indisputable.

Is there a tool that can measure CTE while an individual is alive, or is this always done in the course of an autopsy?

Dr. MCKEE. Well, no. Right now we have no way to diagnose CTE during life. And, you know, it has been a huge battle, I think, for us to even recognize that CTE is an issue. We have had to wait until these players died and they had a postmortem diagnosis to recognize the condition.

Mr. DELAHUNT. It would appear, however, according to what seems to be more than a consensus, almost a unanimous opinion, that CTE is indicative, is without doubt a factor that, if we had awareness of, could be a prognosticator in terms of what would happen, particularly to young people who were participating in football later in life.

Dr. MCKEE. Oh, I think there is just tremendous things that we need to learn. And we can actually learn them first from these autopsied individuals. We have learned where the disease affects the brain the most. We didn't know that 2, 3 years ago. Believe it or not, there has been an explosion of knowledge just concerning this disorder. And——

Mr. DELAHUNT. I don't have too much time. Is there research being done now——

Dr. MCKEE. Yes.

Mr. DELAHUNT [continuing]. That would provide a diagnostic tool so that, if I happen to have sons and I was concerned, that I could refer them to your shop or some hospital to inform me as to whether there may be a future risk involved?

Dr. MCKEE. Well, what we are doing is setting up longitudinal studies of players, and we are looking for that way to diagnose it during life. We are going to take what we have learned from it at postmortem exam and apply it to people that are living. We don't have that technique yet. We——

Mr. DELAHUNT. Is there enough funding available?

Dr. MCKEE. No, we always need more funding. We have just the beginnings of funding.

Mr. DELAHUNT. Well, what I think we have is an epidemic. And I dare say that, just given the autopsies that have been performed on deceased NFL players—I mean, how many players at any given time are in the National Football League? I mean, it is minuscule when compared to the universe of 5 million participants any given year in football.

And we hear that, you know, in terms of people in high school, obviously they don't have the same physical capacities and strengths that someone would in college or someone would in professional sports.

There could very well be—I am going to put this out as a premise and welcome comment—there very well could be much of our concerns about depression, about Alzheimer's, about the whole array of injuries or symptoms associated with the functioning of the brain could be as a result of, I think the term is post-concussion syndrome. Am I in the ballpark, or am I way off?

Dr. MCKEE. No, I think you are absolutely in the ballpark. The point I think that I am hearing from you is that CTE could be playing a much bigger role than we presently realize and that CTE may be responsible for the depression we are seeing in these retired players, may be responsible for the cognitive impairments in the retired players, but may also play a role in society at large.

Mr. DELAHUNT. Exactly.

Dr. MCKEE. There are lots of people that have suffered head injuries; they have lots of memory disorders and psychological problems. We have no—this is really an untapped concern that I am sure our knowledge needs to expand dramatically in to.

And then don't forget the soldiers.

Mr. DELAHUNT. Right.

Dr. MCKEE. I get calls and e-mails from soldiers every day talking about memory concerns, how they had an IED.

So this has huge legs, and we are just scratching the surface.

Mr. DELAHUNT. I would suggest, Mr. Chairman, that there should be a real sense of urgency about the kind of funding that would be appropriate and necessary to deal with this. Because, on the other end, the costs that are associated with depression, with memory loss, with dementia, with Alzheimer's are costing society far more than the funding that would hopefully result in a diag-

nostic tool for us to have the kind of informed patient or informed parents to make a decision.

And, with that, if anyone else wants to comment. Chris, do you want to comment?

Mr. NOWINSKI. I think you are absolutely right. You know, we have a longitudinal study now of 175 athletes that are going to donate their brains to us when they die. And most of them come out to us because they have this constellation of symptoms, but they have never been diagnosed. Most of the brains we looked at that had dementia were originally diagnosed as Alzheimer's brains. So a significant percent of Alzheimer's patients are actually CTE patients; we just don't know what that is.

And, if you want to look at outside research, look at the head injury rate in the prison population. You wonder what maybe turned these people bad. I will give you one example, my former colleague at WWE, Chris Benoit, who killed his wife, killed his son, killed himself. He had a very severe case of this disease at 40 years old. So this is much bigger than we realize.

Mr. CONYERS. Thank you for your line of inquiry, Mr. Delahunt.

Mr. BENSON. I would like to add a brief comment to what Mr. Nowinski said. When we are talking about disorders that cause cognitive disorders, we are not just talking about Alzheimer's, or maybe we are not even talking about lower SAT scores. We are talking about fundamental problems like emotional control and impulse control that can show up as huge distractions and disorders throughout life.

And every year there is some kind of extravagant behavior on the part of football players in one age group or another, and I am forced to wonder what is the true cause of that behavior. Could they have had impulse control loss due to a football injury?

Mr. CONYERS. Uh-huh.

Sheila Jackson Lee, Texas.

Ms. JACKSON LEE. Thank you, gentlemen and lady, very much. We are in and out because there are overlapping hearings and meetings. But I can't express, articulate, I think, at the level of importance that this hearing, I believe, is for the Congress but also for the American people.

I disagree with my colleague, and I do believe that labor negotiations are vibrant and vital. And I think they are what they should be: adversaries or maybe even people who agree with each other working out responsible rights for both management and players.

But, as I have listened to the witnesses and listened to Mr. Benson, who hails from my home State, and I know from which he speaks—no politician sets up an event on Friday night football unless you are sitting in the stadium watching Friday night football in Texas. And so I know how intimately this whole game is for those who live in many places and certainly Texas.

But, as I listen to you, I don't see any way to handle this holistically unless it rises to the level of the national game. It is a national game. It is America's pastime. It raises to the level of a congressional response, as I said, not in a punitive manner, but in a collaborative manner, in a manner that says, "We want the sport to last. We want there to be more boys playing." And, of course, we

have girls football, I understand. But we want more people playing and more people lasting.

So, Mr. Barber, let me thank you for the good times you have given to a lot of folk who have watched you play. But let me just ask this question. I am going to give rapid-fire questions if I can get rapid-fire answers.

Do you think the structure of the NFL contracts are contributory to players shielding their injury and symptoms? And is there anything we can do to change that culture?

And I am going fast because I am going to Mr. Benson and Mr. Nowinski.

Mr. BARBER. I will answer that question. Thank you for that question, Ms. Jackson Lee.

I think a lot of it comes down to pride. I know when I was playing and I would get hurt, I didn't want to come out of the game because I hated seeing someone else do my job. I never thought about the economic benefits of playing. I think my contracts weren't incentivized based on playing time, yardage, et cetera. But, for me, it was a sense of pride, because I loved doing my job.

Ms. JACKSON LEE. Can we balance that pride with ways of—and you are right, I was going to refer to playing time and incentives to keep people in, but you are saying pride.

Mr. BARBER. I think how you balance that is with education. If you give players—and I mentioned this with Mr. Goodlatte, as well—if you give players the knowledge of their injuries and the potential dangers of their injuries and have them take control of it, as opposed to relying solely on doctors' inputs or trainers' inputs or coaches' inputs, they are much more likely to make the correct decision should they get a concussion.

Ms. JACKSON LEE. But we need to help support them in that by educating trainers and coaches so that they don't get the evil eye when they do decide to come out because they do have CTE.

Mr. BARBER. Of course.

Ms. JACKSON LEE. And I know the evil eye is there.

Mr. Benson, let me offer to you my sympathy, and try to get just an understanding. You said something very important, that we need to—Mr. Chairman, I am hoping that this testimony that we have heard might be on the Judiciary Committee Web site, and indicate to parents across America, spend some time reading the outstanding testimony that this panel has given.

Mr. Benson, your bill in particular—and I had many of these cases in my own congressional district. In fact, one summer it looked as if we had one or two or three or four of those kinds of incidents on the field. People were dehydrated, et cetera. You believe that we should include the high school playing of football, is that not correct?

Mr. BENSON. Could you ask it again? I am sorry. I didn't quite hear you.

Ms. JACKSON LEE. You believe we should include high school football, as well, in our assessment of improving safety and ensuring safety on the field?

Mr. BENSON. Absolutely. And the summer you are referring to may have been the summer my own son died. Seven players died that summer.

Ms. JACKSON LEE. And so, your "Will's Bill" in Texas deals with that kind of inattention and requires more attention to these young men?

Mr. BENSON. Absolutely.

Ms. JACKSON LEE. I want to get a copy of the bill.

I want to go to Mr. Nowinski because he fascinated me with referring to that shocking incident that everyone was just saying why. Tell us about the wrestler that no one could explain what was going on. You have documented evidence that that was a CTE victim?

Mr. NOWINSKI. I worked on that case with Dr. Bailes and Dr. Omalu. It was summer of 2007. Chris wrestled for 23 years and was known as a guy who wouldn't take a day off. He was a very physical wrestler. He once confided to me about a year before the incident, when I was working on my book, that he had had more concussions than he could count. And he actually seemed very interested in my work, so I think he knew something was wrong with him.

In talking to wrestlers who knew him in the last year, he stopped calling wrestling matches beforehand because he couldn't remember. He started acting very emotionally bizarre. He was keeping a very strange journal. And then the incident happened, he killed everyone over a couple of days.

The media jumped on "it was a steroid incident." And we knew that, from what he told me and what I had known with these other cases with Andre Waters and with Terry Long both committing suicide, I thought otherwise. We looked at his brain, and it was actually, at that time, it was the most damaged brain. It was more damaged than Waters and Webster and those guys. It was very severely damaged.

Ms. JACKSON LEE. So you were able to look at Chris's brain?

Mr. NOWINSKI. Yes.

Ms. JACKSON LEE. And found the evidence of CTE.

Mr. NOWINSKI. Yes.

Ms. JACKSON LEE. So if we take both of these—the wrestlers, as I understand it—correct me—don't wear helmets. And I have listened to, I think, Dr. Bailes—I am sorry, I am looking at—the testimony as I came into the room, talking about the new technology. Which I don't understand, if we can land people flying into space, as I am an advocate of, we can do better on technology.

But do you wear helmets wrestling?

Mr. NOWINSKI. No.

Ms. JACKSON LEE. So how would we intervene if we took the two together?

Mr. NOWINSKI. Dr. Maroon and I were talking about that, because he is the new medical chair for the WWE. And it is actually much easier, because since pro wrestling is fake, the contact is always accidental. It is just a question of risk management and education of our guys.

Ms. JACKSON LEE. All right. So what we have overall is, in essence, a curable entity. It may mean that we look at the NFL in terms of legislation or some intervention that, again, is not punitive but is helpful. And then we look at the high school football—

you made a very important point, weaker necks in high school students, using the helmets.

And I guess the last point is to go on to Tiki Barber's point, and I think you made it too. What is this about being in a circle and you know you have a concussion or you think you have one but just go on and play? How do we break that for your age, for the high school and the college players?

Mr. NOWINSKI. Yeah, I would echo Tiki; it is education. It is always going to be hard yourself to self-diagnose and take yourself out, not only because of pride, but also because you just had a brain injury and you aren't thinking straight.

Ms. JACKSON LEE. Right.

Mr. NOWINSKI. But if every one of your teammates knows, by you staying in the game, you could really end up messed up, those guys like you, they are your friends—there are many incidents now in the last probably only year or 2 where players will tell the coach, "Get him out of there. There is something wrong. Get him evaluated." So if everybody knows, if the coaches know and the players know and the parents know, this stuff would not happen.

Ms. JACKSON LEE. And then we work on the other side with getting the technology investment to make a helmet that is befitting of a Nation who travels into space and has an international space station.

Mr. NOWINSKI. Absolutely.

Ms. JACKSON LEE. Wouldn't that work?

Mr. NOWINSKI. Big improvements in the helmet.

Ms. JACKSON LEE. Mr. Chairman, let me thank you for allowing the line of questioning. I think I was able to listen to the statements or the testimony from the neurologists that this is something that we cannot overlook, and we can find ways of solving it.

I hope the education, however, is for the whole structure. Because players being educated—and parents be frightened and intimidated, "I don't want my son to be the one on the bench and miss these opportunities, and my coach and trainers don't understand." So I think the whole—it has to be an infrastructure change if we are going to get the best results.

Thank you. I yield back.

Mr. CONYERS. Thank you.

Maxine Waters, you are now the person that will end our discussion that has gone on so long. We thank you.

Ms. WATERS. Thank you very much, Mr. Chairman, for your patience. Thank you for your interest in this subject. And this is not the first hearing you have held basically focusing somewhat on the NFL but focusing on various aspects of the problems with football and the NFL in particular. And today this focuses on brain injury.

I would like to first thank—aside from thanking you, secondly I would like to thank Mr. Dick Benson. I thank you for coming to this Committee to relive the pain and trauma of your child's death. That is not easy, and I understand that. And I certainly respect you for coming here and sharing with us today what happened to your child. Thank you very, very much.

I thank all of the other persons who have come today on both of the panels.

I did not have an opportunity to hear it all because, as Ms. Jackson Lee said, we are between Committees. But I did hear part of Dr. Gay Culverhouse, former president, Tampa Bay Buccaneers. Thank you so very much, not only for actually stepping way outside of the box and telling it like it is, but hearing it come from a woman is just so pleasing, to know that not only were you president of Tampa Bay, Dr. Culverhouse, but that you dare to say what a lot of others don't dare to say.

We had a lot of people in here today who were protecting the NFL and a lot of people here today on the payroll of the NFL and hoping that somehow they will look good enough to maybe get a pay raise because they came here and performed for them today. As you know, I don't take a back seat on these issues.

Now, I respect everything that is being done to try and prevent these head injuries. And I have heard everything that everybody has said about what we know, what we don't know, about how we should do a better job of educating and advising. And I have heard what was said about helmets and, I guess, other kinds of equipment, et cetera, et cetera, et cetera.

But, in the final analysis, if you play football, in particular, and other sports, some other sports, there are going to be head injuries. There will be head injuries. I am told that simply by the movement of the brain inside the head that you are going to have people who are going to end up with injuries.

And the reason that I come in here today is not so much that I need to be told that the study is correct or maybe it is not so correct. I mean, I have common sense, as most of us have, and we know that hard hits and people hitting their heads will do something; you are not going to be the same.

And we do know that there are people who have had concussions, football players, who were sent back out on the field. My husband was a football player. He told me about the times that people were knocked out and they were put back. And, in the day, it certainly happened perhaps more than it happens now. So I am concerned about the children, the football players, et cetera.

But for the NFL that is $8 billion strong, I am concerned about what they are going to do to compensate these players and their families after it is known that they have dementia or that they have received these serious injuries and they have to end up fighting—I mean fighting with the NFL to try and get some support for their families.

I have not been involved with the brain injuries, but I have been involved with trying to assist other football players who happened to be friends of ours, two of whom have died, who fought with the NFL for support.

Today, as we sit here and talk, the NFL is in negotiations. And I asked if, in fact, they were entertaining anything in those bargaining sessions about head injuries. Of course I didn't get an answer, because it is not happening.

And so, Mr. Chairman, while, in fact, I know that you wanted to take a look at the study today and to learn exactly what is going on that will be helpful in preventing these injuries and what can be done to prevent them and all of that, we must keep our eye on the ball, and we must understand that the NFL has an antitrust

exemption and that that is big. I mean, that is huge. And if we ever want to get them to do the right thing, we have to have them know and understand that we are going after that antitrust exemption.

They cannot continue to enjoy making the money that they are making and not being willing to compensate these injured players and their families, who are dying on the street and dying in alleys, broke, with dementia. And they are not the stars that they were when they played when they are in those alleys.

And so I am committed to the proposition that we have the authority, we have the authority, to take away that exemption. And that is what we need to start down the road to do, in order to get some compensation for injuries that are going to continue to happen no matter what anybody says.

I yield back the balance of my time.

Mr. CONYERS. Thank you so much.

I am going to insert *The New York Times* article by Alan Schwarz in today's *The New York Times,* "N.F.L. Players with Head Injuries Find a Voice."

[The information referred to follows:]

4 of 5 DOCUMENTS

The New York Times

October 28, 2009 Wednesday
Late Edition - Final

N.F.L. Players With Head Injuries Find a Voice

BYLINE: By ALAN SCHWARZ

SECTION: Section A; Column 0; Sports Desk; Pg. 1

LENGTH: 1144 words

DATELINE: TAMPA, Fla.

As the president of the Tampa Bay Buccaneers and the daughter of their owner, Gay Culverhouse was the woman in the men's locker room. Twenty years later, she is trying to keep her former players out of the emergency room.

Sitting at a restaurant here Friday, she reconnected with a few Buccaneers retirees. There was Richard Wood, the fearsome linebacker known as Batman whose searing migraines and tendency to get lost while driving near his home leave him scared for his future. Across the table was Scot Brantley, an even harder hitter through the 1980s whose short-term memory is gone. Then there was Brandi Winans, former wife of Buccaneers lineman Jeff Winans, who slipped into such inexplicable depression, fogginess and fury several years ago that their marriage splintered.

Culverhouse looked at disability forms, listened to stories, offered counsel and expressed regret. She has done the same via telephone for another half-dozen former Buccaneers in their 40s or 50s who have increasing cognitive problems. Having followed story after story detailing how National Football League retirees are experiencing various forms of dementia at several times the national rate, and listening to the league and its doctors cast doubt that football played any role in their problems, she has emerged after 15 years to reconnect with players and sound an alarm.

She will testify before the House Judiciary Committee at its hearing on football brain injuries on Wednesday to, as she put it, "tell the truth about what's going on while I still have the chance."

Culverhouse has blood cancer and renal failure and has been told she has six months to live.

"I've got to see that someone stops this debacle before it gets any worse," said Culverhouse, 62, the daughter of the former owner Hugh Culverhouse who held various executive positions from 1985 to 1994. "I watched our team do anything it could to get players back on the field. We have to make that right."

The N.F.L. and the players union have added programs to aid former players since their pension and disability plans came under public fire two years ago. One helps with joint-replacement surgeries, another with cardiovascular health screenings. The most prominent is the 88 Plan, which helps pay expenses for players with dementia. But for the hundreds of those whose cognitive decline falls short of dementia, the industry's disability plan has little to offer.

A recent New York Times analysis of the plan's 73 current members suggested that N.F.L. retirees ages 60 to 89 are experiencing moderate to severe dementia at several times the national rate. A recent telephone survey sponsored by

the N.F.L. had similar results, corroborating findings from several independent studies, but the league and its doctors continue to discredit all evidence of such a link.

"Telling the players that football has nothing to do with it is literally adding insult to injury," Culverhouse said. "It's a joke. It's unconscionable."

Culverhouse read about the controversy, heard about how her former lineman Tom McHale had died at 45 with brain damage associated with boxers, and began calling her former players.

She had always been an N.F.L. misfit. An alumna of Columbia University with a master's degree in mental retardation and a doctorate in special education, she later became the Buccaneers' vice president for community relations and eventually president in 1991, always amid whispers that she was just the owner's daughter. But she relished a good fight; she caused a local uproar by threatening to sue the Palma Ceia Golf and Country Club because as a woman she was barred from using the team's corporate membership.

Every former player Culverhouse called had debilitating physical problems, she said. A stunning portion had cognitive ones, even in their mid-40s, and most of them lacked the short-term memory or concentration required to seek medical assistance or slog through the disability paperwork. One player told her, "I'm headed for the 88 Plan."

"The thing that I always admired about Gay is that she's a rebel with a cause," said Brantley, 51. "Football was a man's world. Still is. I've always said, if you want something done and done right, get a woman involved. No one else has shown any interest in us for a second. We might as well have the plague."

At a Lee Roy Selmon's restaurant in Tampa -- Selmon is a former Buccaneers defensive lineman -- Culverhouse spoke with her former players about others who might need her help, including a former Buccaneers fullback.

"I've got to get to" him, Culverhouse said.

"He's not good, no," replied Wood, 56. "It's tough to understand him because his speech is so slurred."

"I'll fly to Little Rock and fill out the paperwork for him and drive him to the doctors," Culverhouse said. "You get so far gone that you can't deal. It's easier to go home, pop a few pills for the pain and forget about it."

"Tell me about it," Brandi Winans said. After learning how cumulative brain trauma can contribute to serious emotional and substance-abuse problems 20 years after retirement, she said while breaking down, "I felt that I had deserted him." Brandi and Jeff Winans now reconnect on the phone twice a week. He lives in Northern California, and has said he is pursuing medical assistance for his cognitive issues.

All four at the table -- the executive, the players and the spouse -- insisted that they loved football and hoped it would continue. But they said that discussing the consequences of professional football in the 1970s and 1980s, when players routinely played through concussions with no idea of the risks, was important to comfort the retirees and, more important, to emphasize the seriousness of brain injuries to today's amateur athletes.

Dr. William Carson, the Buccaneers' team orthopedist from 1987 to 1997, said in a telephone interview that during his time and certainly before it, most players with "dings" -- now understood as mild concussions -- would be returned to games. And the players who never came out also played through those dings, and worse, risking cumulative damage only now understood.

Just the other day, Culverhouse called another one of her former players, Randy Grimes, who told her about his addiction to painkillers and his dwindling short-term memory. She helped explain his disability-plan options, how he was not alone. She did not tell him that she was dying, and that she would soon be in Washington sharing her experience with Congress.

Before they hung up, Culverhouse said that Grimes remarked: "I think I'm fighting this real good, Gay. Your father would be proud of me."

Culverhouse replied: "That's just amazing to me. Because what you did for Dad, playing so hard for us and not knowing the risks, that's what got you into this mess."

URL: http://www.nytimes.com

LOAD-DATE: October 28, 2009

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GRAPHIC: PHOTOS: Gay Culverhouse, former president of the Tampa Bay Buccaneers, is speaking out on behalf of players like Richard Wood. (pg.A1)
BrandiWinans, former wife of the Buccaneers lineman Jeff Winans, who has exhibited depression, fogginess and fury.
Scot Brantley said of Gay Culverhouse, "The thing that I always admired about Gay is that she's a rebel with a cause."
(PHOTOGRAPHS BY CHRIS LIVINGSTON FOR THE NEW YORK TIMES) (pg.A3)

PUBLICATION-TYPE: Newspaper

Mr. CONYERS. And I can't thank all of the witnesses enough.

Without objection, we will have 5 days for Members to submit additional testimony. We will also have 5 days for other witnesses to submit any materials or additional comments to their own statements.

And I will submit a statement received from Brent Boyd, a retired NFL player who suffers from cognitive problems resulting from football head injuries.

[The information referred to follows:]

Testimony of Brent Boyd-

Disabled Retired Player, concussion victim of NFL,

and

Dignity After Football.org (DAF)

Before the House Committee on the Judiciary:

Hearing on Legal Issues Relating to Football Head Injuries

2141 Rayburn House Office Building

October 28, 2009, 10:00 a.m.

Chairman Conyers, Ranking Member Smith, Members of the Committee. My name is Brent Boyd. I appeared before you to deliver live testimony at your first hearing on the treatment of injured retirees by the NFL in 2007. I am proud and grateful to have been asked to submit additional written testimony for your hearing today. Could you see me again before you today, you would notice the degeneration in the speed of my speech due to my condition, which was diagnosed in 1999 as post-concussion syndrome, and diagnosed at the too young age of 49 in 2007 with dementia and Alzheimer's, a direct result of the multiple concussions I received during my six years as an NFL lineman for the Minnesota Vikings. I now live on Social Security Disability. Now, at 52 years old, I am an Honors graduate from UCLA who has not been able to work since 1999, have been diagnosed by social security as being totally disabled due to repetitive NFL concussions. I now sleep most of the time and leave the house mainly to go to the grocery store or doctors only.

I see several doctors every week, and every doctor- -in the dozens, now--has agreed upon the diagnosis of post-concussion syndrome. Yet a single dissenting doctor, who refused to look at my brain scans and refused to look at the body part he was allegedly diagnosing, is the only doctor being listened to by the NFL disability system in the evaluation of my disability. This is the kind of treatment, endemic to the NFL's disability evaluation system, which has contributed to all manner of needless suffering among ex-NFL players, including homelessness, broken marriages, and suicides.

In that context, I might be called one of the 'lucky ones' comparatively. When compared with Mike Webster, who died in his early 50's after cutting himself off from friends due to the humiliation he felt at his deteriorating condition and finances, I am lucky. When compared with Charlie Waters, who committed suicide out of despair because he could not find help, I am lucky. Compared even with the "average" ex-NFL lineman, whose age of

death is 52 according to OSHA, I could be said to be one of the lucky ones--at least for the present.

The rapid degeneration in mental and physical capacity I have experienced in recent years, I'm afraid, suggests that I might soon be just "average" in this context. I am, indeed, afraid.

Nevertheless, once again, though my speech is now a bit halted and my memory a bit dimmer now, I will try to speak for those who are not as lucky as I am: about the unconscionable delays and denials of their claims by the NFL; about the exhausting fights they must make to pursue those claims; about the lack of help afforded them by their own Players Association because it only represents only current players; about the humiliating necessity of having to appeal to private charity to live in a world where everyone thinks all ex-NFL players are multi-millionaires; and about the fear they experience as they view a future in which the

only certainties are terrifying ones, as their memories and mental faculties inexorably degenerate and disappear.

Perhaps it is best, though I did ask for the privilege, that I have not been invited by the Committee to appear before you again today. Since testimony is timed, I would have had to explain that, when under stress, the damaged part of my brain gets less blood and mentally, as my doctors put it, "the harder I try, the harder it gets." So I would have had to beg for your patience and understanding on that basis, particularly because this subject makes my very angry, so I need to speak at what is, I'm sure, pace so slow, and so often halted by breaks in my attention, that it would have been uncomfortable to watch. It is also frustrating and, occasionally, humiliating. I would likely have exceeded my five minutes, despite my best efforts. Time itself proceeds differently for me, since I retired from the NFL at age of 30, already debilitated by concussions but told by NFL that such mental symptoms were from anti-inflammatory meds for my knees.

I do wish, though, for those of you who were here when I last testified two years ago, and who could remember my delivery of it then, only that you could see me read my statement and respond to questions today.

If you did, I'm sorry to say that it would be obvious to you how much less effectively I can communicate now. And that is only one index of my decline since then.

I am not good for much, now, except as a living example of what the life of an NFL lineman can do to a person's body and brain. Still, telling that story with a voice and body that now demonstrate its implications very tangibly gives me what sense of purpose I have in this life, so I am sorry you cannot hear more from me again today.

Since that last hearing, I founded an Internet blog called "Dignity After Football.org" (DAF), which is dedicated solely to advocacy and online conversation on this issue. Some of the contributors log in from library computers because they are homeless. Others range from the very privileged, both ex-NFL players and interested citizens, to those wanderers who roam the streets waiting for help, as Mike Webster and Andre Waters waited for so long. Having a platform to express solidarity with these men has been a great gift to me. It has also been valuable therapy, since the inherently delayed format of a written blog gives me the opportunity to organize my thoughts, which is a great struggle for me in a real-time conversation. Again, in spite of everything, I am a lucky man in many ways. But I know many who are not. I want you to hear their voices through me.

Had I testified in person, I also would have introduced my wife, Gina, a mechanic for the U.S. Postal Service, and my 18 year-old son, Anders, who could not have joined us, since he is a firefighter

in Lake Tahoe spending the summer fighting wildfires. They are the biggest victims of what I, and many others, would call a crime: my son, while in grade school, suffered our homelessness and poverty, even though my disability claim had been approved by two NFL doctors. This is the "delay, deny, and hope they die" posture the NFL has taken towards a generation of ex-players like me. We do not have the resources to fight the NFL, whether legally or in the court of public opinion. Our stories seem repetitive because they are all so similar. It does not make for edifying or even interesting stuff, in the end. It is all bad prose. We are endlessly put off, until we disappear, one by one. Till then, we put our stories down on paper, like messages in a bottle. We hold press conferences in "undisclosed locations" while the people who batter us are asked to tell their stories to the world on C-Span. Their names are written on the side of buildings and stadiums, which are often paid for by an adoring public's own money. Ours are written on water. We are not very interesting. We know, but

we try. We must. There is simply nothing else for us to do but to tell our stories and hope.

Still, I want to thank the Committee for having the courage to hold these hearings, which in some sense do seek to engage the rich and powerful NFL on its chief corporate sin—the manner in which it has treated its injured ex-players and sought to obfuscate the devastation that head injuries, in particular, visit on them in their post-NFL lives. What you hear today will, I hope, lead to more hearings, continued oversight and, for the sake of so many suffering ex-players, I pray that you will use those oversight powers to demand changes in the NFL's policies and practices.

Moreover, as we all know, the NFL is seeking a blanket exemption from the antitrust laws. How does the old song go, "The rich get richer and the poor get . . . ." What is it the poor get? My memory seems to be failing me again. Attempts at humor aside, I hope, at the very least, that no one in Congress would even consider

granting the degree of commercial and legal freedom such an exemption would represent until the NFL can demonstrate that it has lived up to its fundamental moral responsibilities regarding its ex-players.

Freedom without responsibility is merely license. The NFL has taken enough of that. It need not be given more.

In the following pages, I will relate the shocking but true story of my experience with a gentleman named Tom Condon, perhaps the biggest sports agent in the game of football, who inexplicably plays that role while he also sits on the NFL's disability board, and with the disability board itself. Since Mr. Condon and the others on the board act as the NFL's agents, I will simply refer to the "NFL" as the collective entity of the story. My case involves the controversial topic of concussions, which is the subject of today's hearing. Much as the tobacco companies fought endlessly to avoid any link between smoking and cancer, the NFL fights with a

similar ferocity and sense of mission to avoid liability for the unspeakable carnage caused by football concussions. Like those tobacco executives, who famously stood before Congress a few years ago and swore to tell the truth about their product, the NFL and a group of paid medical "experts" will no doubt paint a more benign picture of the injuries themselves and a rosier one about the League's efforts to care for the suffering. For, like the tobacco industry, the destruction NFL football wrecks upon its players bodies and brains in the normal course of playing the game (particularly the latter, since medical treatment for brain injuries is so expensive and disability from them lasts a lifetime) might pose an existential threat to that business in the long run.

As tobacco lawyers maintained that the public had long been "on notice" of the dangers of smoking, their clients hired PR professionals and willing scientists to distorted the truth about their toxic product. Similarly, the NFL employs willing physicians who will today publicly minimize the effects of concussions and insist

on an uncertain connection between them and the sufferings of many ex-NFL players. My story and my condition, along with those of numerous other ex-NFL players, beg to differ.

I was an "A" student growing up in La Habra, California. I graduated WITH HONORS from UCLA in 1980. I was drafted in the third round by Minnesota. Those accomplishments required hard work, energy, dedication and full mental capacity. But all these qualities would soon be washed away by my many concussions in the NFL.

It took many years to diagnose but, in 1999, doctors finally linked my symptoms to head injuries. I was sent to neurologists, who gave me tests and brain scans that revealed the exact location of my brain damage. I was a single father. Yet, even *after* it was made aware of my condition and the fact that my son and I were homeless, the NFL ignored us, and employed their usual

tactics…they delayed as long as possible, denied, and hoped I would just go away—or worse.

Meanwhile, baseball agent Barry Axelrod organized a group of baseball players and UCLA alums to keep my son and I alive. This group, I am now told, included baseball greats Mark Grace, Rick Sutcliffe, Jeff Bagwell, as well as actor Mark Harmon, NBA legend Bill Walton and his brother Bruce, himself an ex-NFL player. I also was kept alive physically and spiritually by Pastor Don Seltzer & North Coast Presbyterian Church in Encinitas CA

In short, to pursue the benefits to which I was entitled under the collective bargaining agreement, I was initially sent by the NFL to their own chosen neurologist, who not only totally approved my claim, but also voluntarily brought me back for a second day of testing to confirm his suspicion that I was suffering vertigo due to my concussions. His testing confirmed this, and he reported that to the NFL.

The NFL, through the disability board, rejected this favorable report from its own doctor and sent me to see a second doctor of its choice. This doctor also enthusiastically supported my claim.

The NFL, in turn, rejected this second favorable report and the board tabled my case for another 90 days, until its next meeting. At that meeting, the board still refused to approve my claim. Its members did agree that I am totally and permanently disabled but, in spite of all the evidence before them that my condition was football-related due to concussions suffered during my career, they gave me only much less lucrative non-football related benefits.

Eight months passed and, despite the fact I lived in San Diego and I was a single dad, the NFL forced me to fly across country to see a third doctor it had picked specially for my case. He was not on the NFL's list of pre-approved doctors, but was brought in specifically

to evaluate my case a third time and, eventually, to deny my benefits.

The explicit reason the NFL gave for the third examination was that they wanted me to take a very sophisticated neuropsychological test, and they specifically wanted Dr. Barry Gordon of Johns Hopkins to administer that test. Mr. Axelrod and I agreed that this request seemed not only duplicative but also suspicious and I initially refused to travel cross-country for the exam. The NFL, through Mr. Condon and Groom Law Group attorney Doug Ell, was adamant, however, that I would see Dr. Gordon--and *only* Dr. Gordon--or I would be denied, automatically and finally.

I wound up seeing Dr. Gordon for about 30 minutes. He hit my knee with a hammer, tickled the bottom of my feet, and ran some tests that neurologists have since told me tested only nerve endings, not the brain. He admits he did not either look at my brain

scans or order any of his own. He decided my claim without ever looking at the body part he was supposedly diagnosing in what was purported to have been the most sophisticated available way.

So the NFL flew me cross-country and paid airfare, taxis, hotels and meals, all expenses but the most important one: they did not go to the basic expense of hiring a *neuropsychologist* to administer a neuropsychological test. This new, admittedly complex, allegedly more accurate test, which would determine my fate of and my young son's for the rest of my life and all of his childhood, was instead given to me by a young *linguistics* student named Lara Atella. Lara kept telling me at the time that she had never seen the test until the day before, when she took it home to practice on her boyfriend before administering it to me.

So the NFL paired Ms. Atella's test results with the ludicrous report written by Dr. Gordon, which flatly stated that my

symptoms of headaches, depression, dizziness, and fatigue *could not be caused by concussions.*"

On the strength of this conflated, contrived evidence, the board voted unanimously against me. By that time, this process had stretched out years, during which all reports by qualified, NFL-chosen medical experts were in my favor. Now, however, on the strength of this third evaluation, with all of its inherent flaws, this negative report provided the basis for a denial of my benefits within only a few days.

In a revealing and aggravating moment, after my Ninth Circuit case appealing this denial concluded, I found a medical journal with an article written by this same Dr Gordon. In that juried article, written for review of his peers, his medical research concludes that the identical set of symptoms he had dismissed in my case as meaningless in my concussion case—i.e. headache,

depression, fatigue and dizziness--were *"the most common symptoms of concussions."*

I ask the Committee to consider this example, and the course of my entire case as a typical example of the NFL's procedural treatment of retired players who bring disability claims, and particularly claims based on head trauma, not an unusual one. Examine the histories placed before you and see how consistently this process plays out and design your legislative remedy accordingly. This is how it works. This is why the retirees need your help.

In Malcolm Gladwell's excellent recent article on Kyle Turley's condition in *The New Yorker* magazine, he mines the considerable ironies inherent in society's and the NFL's public sanctioning and moral condemnation of Michael Vick for participating in the ugly sport of dog fighting, even while the normal course of NFL play lays waste to the lives of so many of its players and the League erects as many procedural barriers as possible to compensating

them for their injuries. Meanwhile, all this is endorsed and perpetuated by the roar of the crowds and the approval of the law.

Once again, perhaps we injured retirees are comparatively lucky. After all, we are not shot by our owners like fighting dogs when an injury renders us competitively useless. We are just thrown to the NFL's defensive phalanx of the Groom Law Firm and its current system of medical evaluation where our cases are delayed, denied and, it is patently clear, the League, effectively, hopes we die before it will be necessary to pay. My intimate experience with the NFL's disability system, detailed better than I have here in Alan Schwarz's *New York Times* articles, combined with Gladwell's *New Yorker* description of the fate of the poor fighting dogs, leaves me chilled outrage as I consider the aptness of his comparison.

But, even now, I cannot rest on that awful thought. At my best, I still want to believe in the NFL at its best--as the kind of extended family the great Gale Sayers described in his testimony on this

issue before the Senate in the Fall of 2007. Gale and his former teammate, Mike Ditka, have acted as responsible family members by putting their private fortunes on the line and their shoulders to the wheel through the Gridiron Greats Assistance Fund, which has helped numerous players, myself included. Now, it is time for the NFL to step up, once and for all, to this family problem. And I do believe that the Congress, and this Committee, in reflecting the American people at their best with their innate sense of fair play and justice, can and will yet intervene in the NFL's dysfunctional behavior towards its retired family members and administer healthy corrective action.

In that hopeful vein, I believe that this Committee, and Members of Congress, generally, must and will continue oversight, and that they will guide and, if necessary, compel NFL ownership to address and repair this untenable situation regarding the injured and disabled retirees who helped build and sustain their League and their fortunes. It is, unequivocally, the right thing to do.

Thank you,

Brent Boyd

Mr. CONYERS. I thank Mr. Goodlatte and Ms. Waters for their tenacity and staying power.

And this hearing is adjourned. Thank you.

[Whereupon, at 5:08 p.m., the Committee was adjourned.]

LEGAL ISSUES RELATING TO FOOTBALL HEAD INJURIES (PART II)

MONDAY, JANUARY 4, 2010

HOUSE OF REPRESENTATIVES,
COMMITTEE ON THE JUDICIARY,
Washington, DC.

The Committee met, pursuant to notice, at 1:02 p.m., in Room 1460, Wayne State University, 540 East Canfield Street, Gordon H. Scott Hall, Detroit, Michigan, the Honorable John Conyers, Jr. (Chairman of the Committee) presiding.

Present: Representatives Conyers, Sánchez, and Cohen.

Mr. CONYERS. Well, good afternoon. Since the room has quieted down, let's begin the hearing. I welcome everybody and thank you all for coming. This hearing's being held at Wayne State University Medical School where we've been before on other related subjects of healthcare. One I remember most was with the late Senator Ted Kennedy and the Dean of the Congress, Michigan Congressman John Dingle, and myself. We had a wonderful evening, and it's memorable in many respects because that was the last time that Ted Kennedy graced us with his presence.

The medical school was created in 1868 before the rest of the university, and it has been the focal point for brain injuries and related matter since 1939. We are very pleased that the dean and her staff, vice-president, and others have been with us today. So many of you here are distinguished, and the subject matter is one that interests us all.

You might want to know that on October 28 in Washington, D.C., this Committee held a hearing on that subject, the same subject that brings us here today, closed-head injuries in football, but the subject of concussions and related matters in general in Washington, and so this constitutes the second hearing, and we're pleased that all of you are here.

We're particularly excited by the fact that there are so many people with particular expertise, not just testifying but many here that may not testify, and I just wanted to note that we have wide receiver Herman Moore; Greg Landry, quarterback of some fame; Ron Kramer, tight end, Horace King, fullback, Tom Lewoski (ph.) Fullback, Ron Rice, safety, among others that are here.

Mr. THROWER. Jim Thrower.

Mr. CONYERS. Jim.

Mr. THROWER. Thrower.

Mr. CONYERS. Jim Thrower is here.

Gallery MEMBER. Defensive back line.

Mr. CONYERS. So—and there are others, other players here that their names will be sent up to me as we go along.

[The prepared statement of Mr. Conyers follows:]

PREPARED STATEMENT OF THE THE HONORABLE JOHN CONYERS, JR., A REPRESENTATIVE IN CONGRESS FROM THE STATE OF MICHIGAN, AND CHAIRMAN, COMMITTEE ON THE JUDICIARY

Hearing on Legal Issues Relating to Football Head Injuries, Part II
Before the Committee on the Jndiciary
Monday, January 4, 2010, at 1:00 P.M.
Wayne State School of Medicine
Room 1460 Gordon H. Scott Hall
540 E. Canfield St., Detroit, Michigan

The American people, and especially those here in Detroit, face a litany of challenges: at the top of the list is finding stable employment and affordable health care. While I have been fighting for universal health care and full employment for all, I have also sought to highlight serious public health issues so that parents and children fully understand the ramifications of their decisions.

Today, we are continuing our examination into head injuries in football. According to the Centers for Disease Control and Prevention (CDC), more than 300,000 athletes lose consciousness from concussions every year in the United States, and the total number of concussions could be as high as 3.8 million. However, the CDC statistics do not include sub-concussions and other blows to the head, which may not have the same symptoms and signs of a concussion, but also have dangerous consequences.

According to Dr. Bennet Omalu, for every one documented concussion, there may be tens to hundreds of sub-concussions. Many of these head injuries occur in contact sports such as football, America's most popular sport. At the Committee's first hearing on football head injuries in October, we heard incontrovertible testimony from many of the premier experts in the field that head injuries sustained while playing football lead to cognitive problems later in life. Given this evidence, I am particularly concerned about young football players who are at risk. Those in attendance today should be mindful that what's at stake is not just the health of professional players, but the health of millions of children playing football at the high school and youth levels.

Young players and coaches take their lead from the NFL. Many children seek to imitate the supposed "bravery" of players they see on television, who are praised for continuing to play when hurt. Unfortunately, this can come at great cost to young people. Their brains are not yet fully developed, and concussions they suffer can lead to far more serious long-term impairment than in adults. With what we now know about head injuries, it is simply unacceptable for a

young player to be exposed to permanent mental impairments – or even death – just for playing the game of football.

Professional football and its players must recognize that the standards it sets affect the health of children across the country.

Today's hearing presents us with three key questions to be answered:

- Can we definitively state as fact that a connection exists between football head injuries and cognitive problems?
- Are the recent announcements by the NFL and NCAA adequate to address football head injuries in players of all ages?
- And where do we go from here?

First, we must settle any remaining questions as to whether concussions or sub-concussions sustained in football are linked to cognitive impairment later in life. Until recently, the NFL had minimized and disputed evidence linking head injuries to mental impairment in the future. When I asked NFL Commissioner Goodell at our hearing in October whether there was a linkage between football and cognitive decline among NFL players, he refused to acknowledge a connection. While not explicitly recognizing the connection between football head injuries and cognitive problems later in life, the NFL recently conceded for the first time that concussions can have lasting consequences.

NFL spokesman Greg Aiello told the New York Times on December 20th, "It's quite obvious from the medical research that's been done that concussions can lead to long-term problems."

However, Dr. Ira Casson, the former co-chairman of the NFL Mild Traumatic Brain Injury Committee (MTBI), who is here today, still refuses to credit independent and league-sponsored studies linking NFL careers with heightened risk for dementia and cognitive decline.

I hope the testimony today can put this issue to rest, once and for all. One need only speak with Garret Webster, who is here today, and whose father, Mike Webster, died after suffering multiple head injuries when he was with the Pittsburgh Steelers, as to the existence of a connection.

Second, we must probe whether the recently announced steps by the NFL and NCAA are sufficient to protect players at all levels from head injuries.

Since our last hearing, the NFL has made a series of important announcements, including:

- enhancing the protocol for concussions by players;
- helping ensure that independent brain-injury experts clear players before they can return to play;
- encouraging current and former players to agree to donate their brains for medical study;
- shaking up the membership of their concussion committee; and
- suspending the concussion committee's work while proposing to support independent research into the study of brain injuries.

I hope that witnesses representing the NFL can elaborate on these changes, and explain whether the League believes that these steps are sufficient to minimize head injuries in professional players.

Last month, an NCAA panel recommended a new rule that would prohibit players from returning to a game or practice in which they have shown any significant sign of concussion. This rule will apply for athletes in all college sports.

While the NFL and NCAA have made some changes in response to increased understanding and scrutiny of head injuries in football, youth and high school level organizations have not implemented similar reforms. Because high schools generally answer to their state legislatures and athletic associations, measures to protect players may be slower to implement.

Today's witnesses from USA Football, the National Federation of State High School Associations, and the NCAA should explain measures taken in youth leagues, high schools, and colleges to protect young players from head injuries. Furthermore, these witnesses should address efforts to educate young athletes about the dangers of hiding symptoms of concussions. In particular, I expect the NCAA to explain the situation at Texas Tech University. While the

facts are still developing, there are allegations that the football coach at Texas Tech, now fired, retaliated against a player for not practicing after being diagnosed by the team's doctor with a concussion. If true, this suggests there needs to be a culture change, where coaches and players understand and abide by concussion diagnoses and recommendations.

Once we have an understanding of the steps taken so far to educate and protect players, we must discuss a plan to move forward.

At the Committee's hearing in October, the NFL and NFL Players Association agreed to open their health records for an independent review. The testimony we heard in October, and the testimony we expect to hear today, underscores that independent research – untainted by any financial gain – is the key to letting young players and their parents make the informed decisions that will impact the rest of their lives.

We are pleased to see that both the NFL and the NFLPA are committed to supporting research by the Boston University Center for Study of Traumatic Encephalopathy. This support is critical, whether it is financial or simply providing independent researchers with all the access and records they need to get to the truth about how to prevent and treat brain injuries, the ultimate goal of our work here. And there are many organizations doing independent and impartial work, including the National Institute of Health, which should also be given open access and cooperation.

On the list of issues that still need to be watched is the critical issue of helmet safety. Initial reports of the helmet study conducted by the NFL have not been encouraging. According to the New York Times, the NFL's efforts to devise new helmet safety standards have been plagued by faulty science and conflicts of interest.

There are also allegations of antitrust violations, which can reinforce unhealthy incentives to hide problems instead of addressing them, and which this Committee has the particular expertise to explore. Public awareness of concussions has been enhanced after several NFL stars, such as Steelers' quarterback Ben Roethlisberger, Arizona quarterback Kurt Warner, running backs Brian Westbrook of Philadelphia and Clinton Portis of Washington, and standout Philadelphia receiver DeSean Jackson, were sidelined this season because of head injuries.

I hope today's hearing will continue the public education about concussions, and help spread information to the families who have loved ones on the football field. I want to welcome everyone to today's hearing at the Wayne State Medical School, which has been a focal point in the research on brain injuries since 1939, and I look forward to the testimony.

Mr. CONYERS. We'd like to start out with Ms. Linda Sánchez who wants to make a few opening remarks. She's a distinguished attorney who I remember campaigning for when she came to the Congress in the Los Angeles area. She started off being remembered as the first Member to join her twin sister in the Congress, as well, Loretta Sanchez, and we were very pleased that we could get her on the Committee on the Judiciary. She was at our—well, she was holding hearings in 2007 on this subject, and we're delighted that

she left the snowy, cold frigid areas of Los Angeles to be with us today, so I'm very pleased to welcome her, and the only thing we're sorry about, she didn't bring her little boy, who I claim some extended jurisdiction over, and I'm so glad that you're here, and I'm going to put my statement in the record, and ask you to begin the discussion. Welcome to Detroit and to the medical school.

Ms. SÁNCHEZ. Thank you, Chairman, and I just want to make one quick, minor correction. My sister Loretta is not my twin, she's 9 years my senior, and that's very important for me to get out there, and I'm particularly pleased to be in your hometown of Detroit for what I consider to be a very important field hearing, and I think the importance of this hearing is underscored by the number of witnesses who have come today to testify and by the fact that I left 80-degree weather in Southern California to be here, myself, this afternoon.

But as everybody here probably knows, the issues of concussions in professional and amateur sports is a very serious one that deserves scrutiny, and while the NFL is moving toward the playoffs, and the NCAA is concluding its bowl games, it's important to note that we're not addressing this particular issue simply because it's relevant only to football. We're here today because this is a worker safety issue, and it impacts athletes of every level in many different sports.

I'm pleased that since this Committee's October hearing, the NFL has taken a number of serious steps to try to help address this issue of concussions, but I can't help but wondering would the NFL have been as proactive if Congress hadn't taken an interest in the issue and scheduled the hearings in the first place. So I think that our role up here is a very important one because I think we can be a catalyst for change even though there are skeptics who simply deny that Congress is effective at doing anything in particular.

There are increasing studies and a body of evidence that show that there is a significant risk to individuals who suffer repeated head trauma, whether it's in the NFL, in professional boxing, or even high school sports, and while there are those here today who will argue against the validity of some of these studies, there appears to be a preponderance of evidence that a number of professional athletes who suffer repeated head trauma experience physical and mental decline earlier than the general population at large, and it would seem to me—and I stated this to Commissioner Goodell at the last hearing that we held that it would be better for the NFL and the NFLPA to be proactive in alerting its players to the risks that they face, and it's my hope that in the discussion that we have here today, the NFL and the NFLPA will make continued improvements in educating players on the dangers they face by playing with a concussion, treating those athletes appropriately who do have concussions, and removing the stigma that pressures players to play through the injury, and one of the most recent quotes that was heard on November 29th, 2009, was an interview during the pregame show before the Steelers' matchup with the Ravens when somebody said, basically, that he had been dinged up and got right back into the game and that, you know, just because somebody's having headaches, pretty much the quote is, you know,

they need to suck it up and continue to play on, and the fact of the matter is that sucking it up and continuing to play on may mean very serious and grave consequences down the line.

Many witnesses that we have had before the Committee have testified about how the NFL, like it or not, influences the lower levels of football, and the actions that they take or the actions that they choose to ignore to take have significant impact on players at lower levels. The NFL, quite frankly, has vast resources available to its disposal to educate coaches and players and medical personnel on the proper way to handle a concussed player, and if they have all these resources available to them and are not addressing the problem, imagine how can we expect every high school or college to be able to properly treat a concussed player if that proper action isn't being taken at the very top levels of the sport?

I believe one of the most important things that can come from this hearing is the strong need for those who are coaching younger athletes to recognize the damage that repeated head trauma can have on developing brains, in particular, and I look forward to the testimony of our witnesses who will talk about the steps that are being taken to educate athletes on the—at the high school, college, and lower levels to see what further steps we can take to ensure that we are protecting these kids at all level of play.

Mr. Chairman, as I noted above, the last Committee hearing resulted in many positive steps being taken, and I'm pleased that this Committee's continuing to focus on this issue, and I hope that the outcome of this hearing is similarly positive, and I thank you for my time, and I yield back.

Mr. CONYERS. Thank you very much, Linda Sánchez, younger sister of Loretta by 9 years. I don't know why I made that mistake.

I'm now pleased to recognize Subcommittee Chair Steve Cohen, Memphis, Tennessee, who has some familiarity with football, not as a player but as a fan, and a very good friend of mine. I was—remembered him for many years as a State senator from Tennessee before he began his congressional career. He is currently the Chair of the Commercial and Administrative Law Subcommittee, and we worked very closely together on many civil rights issues, civil liberties issues, and we work on copyright, patent, and other matters that come before what many regard as one of the most significant Committees in the Congress. Welcome, Chairman Steve Cohen.

Mr. COHEN. Thank you, Mr. Chairman Conyers. I first would like to ask Mrs. Sánchez to—somewhat unfortunately, I want to correct you. You obviously did not read the Pasadena Star News in November 1965 when I caught the last pass in the Black Hawks game.

Mr. CONYERS. You know, I did miss that. I don't know how I could have missed that.

Mr. COHEN. It was the only game my parents ever came to witness, and it was the only game in which I was able to have a pass thrown to me and I caught it. But it's a pleasure to be here with you, and it's an honor to serve in the United States Congress. This is my second term, and I'm fortunate to be on the Judiciary Committee that I think is so important because it's the basics—the base of America, what it is, basic rights, bill of rights, and values, and due process, and equal protection, and nobody does more to protect these than Chairman Conyers. He is legendary and a stalwart and

a voice of conscience of the United States Congress, and so I'm fortunate to serve on this Committee with you and to return to Detroit.

The last time I was here in Detroit was when the GMAC Bowl was playing and DeAngelo Williams who gave Memphis our wholly particularly outstanding year during this century led us to victory over Akron. I did not, like Ms. Sánchez, leave 80-degree weather to come here, but I did leave Elvis at the donut shop.

This hearing is most important, and some people would question the idea of Congress having hearings on issues like this because, as Ms. Sánchez has properly cited, the NFL has changed its policies, and that's important, and the NCAA has some changes in store, as well. They have had a committee recommend some changes on concussions and how to deal with them, unlike the way they deal with them in Lubbock, Texas, you should be sent to the neurosurgeon, not to the shed, and that is shameful what apparently went on there.

But in college and in lesser-level, younger football activities, young people are potentially endangering their future cognitive abilities and ability to enjoy life. Nobody, particularly the very, very, very involved sports fan from childhood wants to see anything happen to this wonderful sport, that is—rivals baseball or maybe has surpassed baseball as America's game.

But nevertheless, the players who we revere, and as I mentioned earlier, as a child, Les Bingamen was my favorite, I guess because he was just so big and he stood out on the screen, but I liked Les Bingamen, and I remember Gale Larry (sic) punted in "Night Train" Lane, who was the defensive back, and all the great lines back then, and Ollie Matson was my hero, and to think that these players may have suffered some type of permanent brain injury and there is plenty of data that gives any person, at least a reasonable cause to believe that there is the potential of brain—permanent brain injury from the concussions that are received on the field.

This is a violent sport, and with the increase in—well, Joe Donellini started it, but the weightlifting, and I don't know who else started the rest of what made everybody so big and so strong, but you've got a lot of violence out there directed at different players and head-on collisions, and when people have concussions, there's damage.

We know it from boxing, I talked to Dr. Casson earlier, and we know boxing has that damage by Harold Ford Patterson suffered from it, Muhammad Ali suffers from it, and we shouldn't put our athletes who are our heros, in many cases, in this type of harm's way if we can protect them by seeing that the medical attention they receive is independent, that it is cautionary, and that the helmets are the best that can be—and other equipment is the best to protect them from injuries, we need to do that.

This Committee and the hearings we've had have made a difference, I think, in the NFL on this issue, and I appreciate the NFL and Mr. Goodell for taking the positions they've done since. There are other things we can do with the committee and bring the attention of America to different problems, and I don't want to divert much but the NBA's one-and-done rule is the situation where

the ownership uses the players for a year and takes away the earning capacity for a year from players who could be making money in the short earning capacity they have because the owners have a vested interest, and Commissioner Stern was honest about it, he said we do this for the good of the team, for the good of the league, not for the good of the players, and in this situation in football, I think Commissioner Goodell has shown some interest in the players, but, nevertheless, there's some, maybe, concern of some lawsuits or what do we know and when did we know it, and that should be secondary to the health of the NFL players and the college players, and the kiddie league players and the high school players, which we all need to be concerned about.

We ask motorcycle, in most states, riders to have helmets and most folks to wear seat belts because we know that they could be injured, and while we don't want to have touch football, we want to have equipment that at least gives, you know, utmost scientific research and development to protect the players from serious injuries.

I look forward to the testimony. I've read much about the different studies in the past, the work at UNC and the University of Michigan and EU, and I look forward to the testimony, and as a fan of the NFL and a fan of athletes, I want to see the athletes come first. I think the owners owe it to them, and I think the owners have not looked after the players as they should have in the past.

Mr. Chairman, I thank you for the opportunity to be with you to be in the great city of Detroit—that is, as Motown, as we have stats that share Ben Hooks and Kenneth Whalum with our cities of Memphis and Detroit, and that has a great NFL football team—a great NFL football history. Thank you, Mr. Chairman.

Mr. CONYERS. Your qualification has been duly noted, and most of us agree with it. We have a distinguished panel, and other Members will be able to submit their statements—other material can be submitted by all of the panelists here. We have Vin Ferrara, founder of Xenith, L.L.C., Harvard graduate; David Halstead, Technical Director of Southern Impact Research Center; we have Dan Arment, President of Riddell, Dr. Ira Casson, neurologist at the Long Island Medical Center; Dr. Bennet Omalu; we have Lem Barney, three-time conference star, quite an impressive record; Scott Hallenbeck, who led USA Football, the governing body of America's favorite sport on youth and amateur levels since the year 2005; Bob Colgate, the Assistant Director of the National Federation of State High School Associations; Dr. David Klossner, Associate Director of Education Services, the National Collegiate Athletic Association; Dr. Joseph Maroon, Certified Clinical Professor of Neurological Surgery, the University of Pittsburgh Medical Center; and DeMaurice Smith, Executive Director of the National Football Players Association, who received his degree from University—Cedarville University of Ohio. He began his career in the U.S. Attorney's office for the District of Columbia, responsible for national security issues, earned numerous honors throughout his career, and in March 2009 was elected executive director of the NFLPA.

One of his biggest challenges is negotiating with the NFL owners who opted out of the current collective bargaining agreement and

also feeling the rift between union—the union and its retired players. He recently announced the creation of a committee within his organization to examine concussions and their effects on sports.

We're delighted to have all of the witnesses here. Their statements will be reproduced in the record, and we want to begin the discussion with them, and of course, we start off with Attorney DeMaurice Smith. Welcome to these hearings.

TESTIMONY OF DeMAURICE SMITH, EXECUTIVE DIRECTOR, NFL PLAYERS ASSOCIATION

Mr. SMITH. Thank you, Chairman. It's a pleasure to be back in front of the Judiciary Committee and also to be in this great state and this great city. I'd also like to say good afternoon to Congresswoman Sánchez, Congressman Conyers, and Congressman Cohen. I have to apologize for my voice. Everybody here will have to suffer through this as my family continues to. They're very happy that I'm not at home today.

Mr. CONYERS. Pull the mike a little closer, please.

Mr. SMITH. It's not going to make it sound any better but——

Good afternoon. As I've testified before, I represent players, both current and former of the National Football League. Please accept our deepest gratitude for shining the national spotlight on the issue of concussions and brain trauma in football. To answer your question, Congresswoman Sánchez, you did make a difference. Congress made a difference. By shining its spotlight and its attention on this issue, you have achieved a significant amount of change in a few short weeks.

I'm happy to talk about a number of the changes that the National Football League has instituted, as well as a number of programs and changes that the players have taken over the last several weeks. In conjunction with this Committee, we have made strides each and every day to make this game safer for those who play football on a professional level, for those who play in college, and for the many players who play in youth sports.

During the next few minutes, I'd just like to outline a couple of the steps that we mentioned during our—my last testimony to give you an update of where we are and where we hope to be. During the October 28th hearing, we agreed to do the following and have provided you with written testimony on our status and our progress.

First: We promised to objectively and honestly embrace all of the studies related to the issue of traumatic brain injury and to create a roadmap to prevent significant and serious injury for football players going forward. In May of this year, the players of the National Football League formed its own players' concussion committee. That committee was designed to do one thing: To get the answer right. That committee, I am proud to say, was not formed by the executive director. It was formed by a player of the National Football League, Sean Morey, who was a special-teamer with the Arizona Cardinals, met with me in the executive committee, and he was committed to do one thing, to get the answer right. He challenged each and every player on that executive committee to get the answer right.

We proudly formed that committee, and many of the people who are on the panel today, including Dr. Omalu, Dr. Nowinski, have agreed to serve on that committee. We will strive to do one simple thing, to get the answer right.

Second: To verify the scientific relevancy of the ongoing studies regarding current and former players. In an attempt to verify the scientific relevancy of the current and previous studies, we have asked, and we, indeed, encourage the National Football League to release to the players any and all communications regarding studies surrounding head injuries in football so that both of our organizations can be working with the same information and can build upon the valuable research.

Third: We have renewed our request, as we have pointed out to your staff, renewed the request for the NFL to provide the injury data and the aggregate injury data that they collect from every player in the National Football League from 2006 to 2008. We believe that that data would not only serve to improve and enhance the ongoing studies, but also, it would serve to—serve as a platform for new studies, not only in the area of head injury, but also in the area of joint rehabilitation, effects of the aging, and a myriad of other ailments that not only plague professional football players and retired players, but also players on every level.

We have committed ourselves to improving the 88 plan. The NFL Players Association called upon the NFL, and I'm glad that they responded, to accept new applicants for the 88 plan in the NCAP year. I am proud to say that they have agreed to do so.

And lastly, we believe that the National Football League and the players in this game owe an obligation not only to those who have played this game, but to those who will play this game in the future. You are right, the National Football League is the standard bearer. If we set the standard, others will follow. As Executive Director of the Players Association, my primary goal is to serve the players who have played this game and those who will play this game.

It is an honor for me to commend people like Sean Morey and Kevin Mawae for forming the Players Concussion Committee. I look forward to working with Dr. Tom Mayer and others on the committee as we move forward to get the answer right to help prevent these injuries where we can and to treat those injuries where they occur.

Ladies and gentlemen of not only the panel but——

(Whereupon the lights in the auditorium went out at 1:33 p.m.)

Mr. SMITH. You know, normally, I have that effect on——

(Whereupon the lights came back on at 1:33 p.m.)

Mr. SMITH. Oh. Chairman Conyers, Congresswoman Sánchez, and Congressman Cohen, on behalf of the players of the National Football League and the retired players, I promise to do one thing, to get this answer right, to come before you on each and every opportunity when you have questions, and to serve the men and the families of this great game. Thank you.

[The prepared statement of Mr. Smith follows:]

PREPARED STATEMENT OF DEMAURICE SMITH

TESTIMONY OF DEMAURICE SMITH

EXECUTIVE DIRECTOR, NATIONAL FOOTBALL LEAGUE PLAYERS ASSOCIATION

BEFORE THE COMMITTEE ON THE JUDICIARY

UNITED STATES HOUSE OF REPRESENTATIVES

JANUARY 4, 2010

Good Afternoon Chairman Conyers and Members of the Committee on the Judiciary. By way of reintroduction, as Executive Director of the National Football League Players Association, I represent the players, both current and former, of the National Football League.

Please accept our deepest gratitude for shining a national spotlight on this issue of concussions and brain trauma in the sport of football. You have forced a change in the tide of the rules governing player safety and the recognition of the science that support these decisions. I offer my thanks on behalf of every player that has, is and will ever play this great game.

There has been much progress in the area of concussion prevention – the NFL, in conjunction with the its concussion committee, made strides by setting return-to-play guidelines governing players that have sustained head injuries during a game or practice. The NFL is also currently running a public service announcement that encourages players to report head injuries suffered by a player or his teammates. The awareness has been heightened significantly due to these efforts by the League; however, it is unfortunate that it took Congressional pressure to force action for such a critical issue. There is simply no justification for the NFL to have previously ignored or discredited Dr. Omalu and others with relevant, valid research. For far too long, our former players were left adrift; as I emphasized at the last hearing, we were complicit in the lack of leadership and accountability but that ends now. I am here again to make it clear that our commitment is unwavering.

My goal today is to proudly provide the Committee with an update on the players' progress in this realm. As you know, we formed the NFL Players Association Players Concussion Committee (PCC) in May of this year to address the diagnosis, treatment and prevention of concussions and traumatic brain injury (TBI) in active players and the long term, cumulative effects of isolated or repetitive TBI in NFL players as patients and how these effects can be reduced or eliminated.

During the October 28, 2009 hearing, we agreed to the following and have also provided an update as to our progress:

1. **To objectively and honestly embrace all studies related to this issue to create a roadmap that leads to preventative measures** – The PCC is actively considering proposals from various companies that manufacture proprietary technologies and products that reduce traumatic brain injuries and improve the diagnosis and

treatment of such injuries, as well as considering partnerships with various institutions with substantive knowledge on this issue.

2. **To verify the scientific relevancy of the NFL ongoing study concerning former players and concussions** – In an attempt to verify the scientific relevancy of current and previous studies, we encourage the NFL to release to us, any and all communications regarding studies surrounding head injuries in football so that both organizations can build upon the same relevant and valuable research.
3. **To renew the request to the NFL to provide the injury data and analyses for 2006, 2007 and 2008** – The League provided some injury data without providing the analyses as requested. We are currently reviewing the data and will renew our request to the NFL for the missing data and analyses that we have yet to receive.
4. **To commission new research and evaluate, follow and disseminate existing research in the area of traumatic head injury** – We have begun this task in the area of helmet safety; we are supporting an increase in helmet safety standards and measurements and access to helmet safety literature. We are also planning to encourage NOCSAE to implement new standards, as well as hosting a roundtable of major helmet companies to identify gaps in the current research pertaining to traumatic brain injuries. To assist in this effort, we ask that the NFL release their prior communications with the helmet companies to further our effort to take precautionary and preventive measures as it relates to helmet design and safety.
5. **To review the procedures for the diagnoses of players and the decision about when a player who suffers a head trauma should return to play** – We are encouraging player compliance with the new NFL rule governing return-to-play after sustaining a head injury and continuing to review any and all injury data and concussion reports.
6. **To improve the coverage provided by the 88 Plan** – We have discussed potential improvements, such as raising the maximum benefit amount and abolishing the distinction between in-home and institutional care. Such improvements are a part of ongoing collective bargaining agreement negotiations.
7. **To reach out to former players suffering from mental and psychologically conditions to assist them in any way possible** – The NFLPA Retired Players department will continue to provide support for retired players who suffer from severe medical conditions and/or are in dire need, through the award of PAT (Player Assistance Trust) grants.
8. **To take steps to become the leading voices to college, high school, and youth leagues about the TBI and concussions and the steps that can be taken to minimize the risks of concussion** – USA Football has taken significant steps to educate the youth on concussions and preventive measures. We currently work closely with USA Football and plan to share with them, our independent analyses gathered by the PCC.

As Executive Director of the NFLPA, my primary goal is to represent, support and serve the players of the National Football League; the credit for forming the Players Concussion Committee, precipitating real change in the brain injury arena and forcing accountability by the League to change

the rules to promote safety in football should go to the players first and foremost. Without their guidance, input and articulation of the issues, we would not be able to report on the progress made in the last few months. Those efforts include the endeavors of the Mrs. Sylvia Mackey, who successfully requested that the NFL to accept new Plan 88 applicants during the uncapped season, the NFLPA Retired Players Chapter Presidents and Steering Committee, Bob Grant and Dave Pear, all of whom presented the head injury issue to the army of former players to raise awareness and apply pressure to the appropriate parties to act.

As I have reiterated over and over again, the mantra of the Players Association is:

WE ARE COMMITTED TO GETTING THE RIGHT ANSWERS, TO WORK WITH EVERYONE WHO HAS THE GOAL OF PROTECTING OUR PLAYERS AND TO SERVE AS A MODEL FOR FOOTBALL AT EVERY LEVEL. WE WILL NOT FAIL.

Much more needs to be done, as the commitment needs be lasting and the parties need to be dedicated to the solution. The NFL should release all of the data that was promised to the Judiciary Committee and all internal analyses and communication pertaining to research conducted on this issue. We need to continue to encourage NOCSAE to update helmet standard testing, continue to communicate with the helmet manufacturers, continue to negotiate the collective bargaining agreement with an eye towards Plan 88 coverage improvements and finally, create a multi-year plan to educate the youth on playing football safely. Protecting the players is the most important aspect of the game and in order to preserve the fans' confidence and the continued participation of the youth, we need to act consistently and transparently to ensure that the integrity of the game perseveres.

Chairman Conyers, thank you again for your stewardship on this issue, as it has ushered in a new era of awareness and accountability. I ask the Committee to continue its leadership in this field, which will help ensure that future generations of athletes are equipped with the best knowledge, technology, and treatment. I look forward to answering your questions.

Mr. CONYERS. Thank you very much. I think you're doing a great job.

Mr. SMITH. Thank you.

Mr. CONYERS. The light went out just as a signal that you were approaching near the end of our allotted time, a very delicate end.

We know that you may have to leave early, so please take our leave whenever you feel it appropriate.

Mr. SMITH. Thank you.

Mr. CONYERS. Welcome, Dr. Joseph Maroon, a neurological surgery professor at University of Pittsburgh Medical Center. In 1999, along with Joe Montana, Kareem Abdul-Jabbar, you were inducted into the Lou Holtz Ohio Valley Hall of Fame for your athletics, for your accomplishments and contributions to sports and medicine. We're very pleased to have you here, and we note that along with another neuropsychologist, Mark Lovell, Dr. Mark Lovell, you developed the Immediate Postconcussion Assessment and Cognitive Testing, the first computerized system to deal with some of the problems that bring us here this afternoon. We welcome you to the hearings.

TESTIMONY OF JOSEPH C. MAROON, M.D., PROFESSOR AND VICE-CHAIRMAN, DEPARTMENT OF NEUROSURGERY, UNIVERSITY OF PITTSBURGH MEDICAL CENTER

Dr. MAROON. It's my great pleasure, Mr. Chairman, thank you very much, and also Congressman Cohen and Congressman Sánchez, I deeply appreciate your preliminary comments, specifically speaking to be proactive and a catalyst for change, and I'm going to address those issues later on in my discussion, but I want to bring up, first, the fact that the MTBI Committee, the Traumatic Brain Injury Committee of the NFL, was formed in 1994 after traumatic brain injuries to Al Toon for the New York Jets and Merril Hoge for the Pittsburgh Steelers and also the Chicago Bears, these gentlemen were both forced to retire because of their head injuries in 1994.

It was at this time that Commissioner Tagliabue commissioned the formation of the MTBI committee with the express purpose of supporting independent, scientific research to further the understanding of the causes, diagnosis, treatment, and prevention of concussion as well as investigate helmet standards and the long-term effects of concussion. That was the mission statement in '94.

In this past October, I presented to you what was being done from '94 to the present time relative to management of concussions, and there were five things. Number one, I outlined for you the educational efforts on behalf of the NFL with the players, the coaches, the trainers, informing them of the potential dangers of concussion. They also instituted neurocognitive testing as a mandatory test, which I think speaks for itself. There were stricter return-to-play guidelines and, also, penalties and fines for head hits, as well as a hotline for any individual in the NFL who feels he is being coerced into playing can call the hotline and make it known that this is inappropriate. Perhaps, that might have helped in Texas, Congressman.

Regardless, I'm here today to show you and to illustrate for you the additional steps that have been taken since our last meeting relative to protection of players and, also, the catalyst for change that the NFL hopes to be in the recent—recent (sic) future. Number one, besides the criteria for return to play that I outlined, being asymptomatic and normal neurological examination and without symptoms on exertion, the NFL Players Association with Mr. Smith and Commissioner Goodell have formulated an independent neurological consultant as being mandatory for the NFL teams.

These are to be mutually approved by the NFL Players Association and the NFL.

Number two, it's a two-way street. The NFL is doing a considerable amount to initiate changes and educate the players, but there's also a player responsibility in this, and that is to report when they have concussions. And yes, I know the motivating factors against that having participated in football at the collegiate level, myself, and the fact that concussions are difficult to diagnose, but we must make an effort on the players to let the physicians and the team personnel know when a concussion has occurred so that it can, indeed, be addressed appropriately.

Third, aware that the NFL is, indeed, now the model for concussion management in the United States, they're speaking to Congressman Sánchez's dictum that with this awareness, with the fact that it is a model of concussion management, how do we get it to the 1.1 million high school kids in the United States and the 3 million youth sport participants in the United States?

And to that end, recently in December, in conjunction with the CDC, the NFL is working on public service announcements that will be shown during the playoff games, as well as during the regular season emphasizing to parents, coaches at the youth league, and also the players, themselves, that concussions at any level is a significant major problem.

Number four, because of the importance of head injuries in the NFL, the commissioner is now strengthening and expanding the membership of the MTBI committee, and the national search is underway at the present time in the recruitment of a new chairman and/or cochairman to continue the work of the committee in a very, very unbiased, independent fashion.

Number six, in terms of equipment safety, in response to the equipment managers who have complained that many different equipment manufacturers come to them complaining that they all say that their helmets reduce concussions by X percent or that percent, the equipment managers wanted objective data just like the impact test is an objective instrument when an athlete can return to play, and the NFL, together with the NFLPA, is working with engineers to grade, to look at, to evaluate various helmets for their protective effect.

When I first started in sports medicine 20, 25 years ago with the Pittsburgh Steelers, the incidence of concussions was 1 in 5 individuals. Every five players had a concussion during the season. That incidence is now into 1 in 20 because of the rules changes, the improvement in equipment, etcetera.

And then finally, working with John Madden as a special adviser to the commissioner, we're looking at ways to cut down on the head impacts, not only during the game with fines and penalties, but also during practice, and in summary, then, the NFL committee has long recognized the long-term effects of concussions.

I think the goal at the present time matches your goals. That is, to make the game safer, to address the needs of retired players, and also to set the right example for players, coaches, and trainers at all levels, and not just for football. It's said that in science, many, many scientific innovations proceed through three stages. The first is confusion when a new idea is introduced. The second

is controversy, which we are all familiar with, and then the four—the third is consensus, and I think with the help of your Committee, the spotlight that Mr. Smith emphasized you're shining on this problem, we are at a point, in my opinion after 25 years in this, of consensus. Thank you.

[The prepared statement of Dr. Maroon follows:]

PREPARED STATEMENT OF JOSEPH C. MAROON

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Joseph C. Maroon, M.D.

Professor and Vice Chairman
Department of Neurosurgery
Heindl Scholar in Neuroscience
University of Pittsburgh Medical Center
Team Neurosurgeon, The Pittsburgh Steelers

January 4, 2010

Legal Issues Relating to Football Head injuries, Part II

Statement of Dr. Joseph Maroon to Chairman Conyers and Members of the House Judiciary Committee
January 4, 2010

Thank you, Mr. Chairman, for the opportunity to testify again today.

At your October 28 hearing in Washington, I testified on the work that has been done since 1994 by the NFL's Mild Traumatic Brain Injury (MTBI) Committee, of which I am a member. Our committee was specifically charged in 1994 with initiating and supporting independent scientific research to further the understanding of the causes, diagnosis, treatment and prevention of concussion. This work has involved research on helmet standards, injury data collection and analysis, and an ongoing study of the long-term effects of concussions on NFL players.

As a result, the NFL in recent years has initiated educational and preventive measures, guidelines for the management of concussions, and rule changes to eliminate unnecessary hits that can lead to concussions. Since the formation of the committee in 1994, there has been a significant positive culture change in the NFL on the issue of concussions. I have personally witnessed this culture change among NFL teams and players and I am confident that it will continue in a positive direction.

I am here today to report on additional steps relating to concussions that the NFL has taken since the October 28 hearing. The long-running arc of improvement continues. Those steps are outlined in detail in the attached memos sent in late November and early December to the NFL clubs by Commissioner Goodell. Let me touch on some of the key aspects of these most recent changes.

The NFL now has stricter return-to-play guidelines. It includes the addition of an independent neurological consultant for each team approved by the medical advisors of the NFL and the NFL Players Association. The 2009 statement on return to play says that a player who suffers a concussion should not return to play or practice on the same day if he shows any signs or symptoms of a concussion. It also states that once a player is removed for the duration of a practice or game, he should not be considered for return-to-play activities until he is fully asymptomatic, both at rest and after exertion, has a normal neurological examination, normal neuropsychological testing, and has been cleared to return by both his team physicians and the independent neurological consultant.

The 2009 statement also addresses the responsibility of the players. It states that players are encouraged to be candid with team medical staffs and fully disclose any signs or symptoms that either they themselves or their teammates are showing that may be associated with a concussion. The nature of concussions, which can be difficult to diagnose in the absence of loss of consciousness, places an important responsibility on players to put their health above competitive considerations. This is the policy of the league with respect to its teams – medical decisions must override playing considerations – and it is extremely important that the players commit to meeting that standard.

In December, the NFL, in conjunction with the Centers for Disease Control (CDC), produced a public service messaged directed primarily at young athletes and their parents and coaches on the importance of head injury awareness. The theme is "Take Head Injuries Out of Play" and the message has been airing and will continue to air on NFL game telecasts throughout the playoffs. This PSA also was sent to a group of conference commissioners of college sports so that they could adapt for their use on television and with their athletes.

In addition, the NFL is working with the CDC and other organizations on educational material for young athletes and high school coaches, and to develop an overall certification program for coaches at those levels addressing player health and safety.

Commissioner Goodell is strengthening and expanding membership of our MTBI committee that has studied this subject and overseen concussion-related research for the past 15 years. The NFL is currently interviewing highly qualified candidates for the role of chair or co-chairs of the restructured committee and expects to select that individual or individuals by the end of January.

The NFL recently announced a new partnership with the Boston University Center for the Study of Traumatic Encephalopathy to fund independent research and encourage current and retired player to consider donating their brains to research upon their death. The NFL is also following up with the 56 players in the University of Michigan phone survey that identified themselves as having memory disorders. This follow-up includes determining whether these players are receiving the league's "88 Plan" benefit for retired players diagnosed with dementia or Alzheimer's disease, and, if they are not receiving that benefit, to work with them and their families to find out if they qualify for it.

Equipment safety is another priority. The NFL and NFLPA are working together on research designed to help manufacturers improve helmet safety and to help NFL players make informed choices on the use of the most technologically advanced helmets. This initiative is part of the league's overall awareness campaign for its players and the general public.

The helmet research project is part of the NFL's focus on reducing the number of concussions in its game. The game is already safer than it was when I started consulting to the Pittsburgh Steelers in the 1970s. However, at the direction of Commissioner Goodell, the NFL Competition Committee is now evaluating more potential changes in playing rules that would be intended to reduce head impacts and related injuries in NFL games. Commissioner Goodell believes that the NFL can take more unnecessary hits out of the game to reduce the risk of concussion for NFL players.

Further, John Madden, in his role as a special advisor to Commissioner Goodell, is chairing a committee of coaches that is exploring ways of providing players with a safer environment to reduce the risk of head trauma in practices. Among the considerations are reducing the overall amount of off-season work, limiting the use of helmets (and therefore contact) in practice, minicamps, other off-season workouts, and training camps. John Maddens' group will report its recommendations to the Competition Committee and Commissioner Goodell.

Our committee, together with the NFL, has long recognized that concussions can lead to long-term health issues, especially if they are not properly managed. These new steps that have been taken since your last hearing enhance the substantial progress the NFL has made in recent years and underscores the NFL's commitment to advancing player safety. The NFL's goals are to make the game safer for the men who play it, address the needs of retired players, and set the right example for players and coaches at all levels of play, both in football and other sports in which concussion is a risk.

Thank you again for this opportunity to address your committee and I would be pleased to take your questions.

Mr. CONYERS. Thank you very much, Doctor. David Klossner is a doctor, but he's a Ph.D., and he is the associate director of education services with the National Collegiate Athletic Association with primary duties on health and safety aspects. He's also a Liaison to the Committee on Competitive Safeguards and Medical Aspects of Sports. He has a distinguished previous career at DePaul,

then at Bloomington, Indiana University prior to completing his Doctorate in Philosophy from Ohio University. Welcome this afternoon, sir.

TESTIMONY OF DAVID KLOSSNER, DIRECTOR, HEALTH AND SAFETY, NCAA

Mr. KLOSSNER. Thank you, Chairman Conyers, Congresswoman Sánchez, and Congressman Cohen, and other distinguished guests in attendance. On behalf of the National Collegiate Athletic Association, thank you for inviting me to appear before you today to discuss the NCAA's multifaceted approach in preventing, identifying, and treating mild traumatic brain injuries and concussions. I've been with the NCAA for 7 years. I, as mentioned by Congressman Conyers, I served as liaison to the NCAA's Membership Committee on Competitive Safeguards and Medical Aspects of Sports, the committee charged with providing leadership on health and safety recommendations to more than 1300 conferences, colleges, and universities that are members of the association.

I appreciate the opportunity to respond to your request for information on a critical medical issue at the core of student athlete well-being. The NCAA and its membership have devoted significant resources to study, educate, and enforce various health and safety standards, including those in the area of football related mild traumatic brain injury.

Chairman Conyers, you'll be interested in learning that since we provided you with the response in October, the NCAA has taken additional steps to further ensure student athlete well-being, and I'll respond—expand upon those in a moment. The NCAA's health and safety recommendations and policies are addressed through the collaborative efforts of national office staff, governance committees, sport playing rules committees, sport issues committees, and external associations for our 23 sports.

Since 1976, the NCAA has warned against using the head as a weapon in football and other contact sports, and for the past 15 years, the NCAA has provided member institutions with specific recommendations regarding concussion management in its sport medicine handbook. In the sport of football, the NCAA football rules committee has made changes over the past 5 years to further protect players against sustaining concussions.

As part of its ongoing review of concussions, the NCAA committee on Competitive Safeguards and Medical Aspects of Sports met on December 13th through the 15th, 2009, to discuss the most recent developments in athletic related brain injury and concussion. The committee reviewed the NCAA injury surveillance data, current policies of the National Federation of State High School Associations, the National Athletic Trainers Association, and the National Football League, and discussed findings of a recent expert conference related to concussions conducted in Zurich, Switzerland.

During its meeting, the committee also consulted with authorities who recommended possible courses of action. As an outcome of this ongoing evaluation of concussions in all 23 NCAA sports, the committee determined that a common playing rule is necessary to provide an emphasis on the significance of head injuries, their prevalence, and the importance to refer for appropriate medical

care. This action is also accompanied by a Concussion in Collegiate Sports Summit that will be held in 2010 to review NCAA policies for medical management of concussions and prevention strategies appropriate to the collegiate environment and the NCAA membership at large.

In addition, the committee will lead a collaborative educational initiative for coaches, officials, and student athletes. The proposed playing rules subject to review by the NCAA Playing Rules Oversight Panel as early as mid-January 2010 would mandate removing from competition and practice a student athlete who exhibits signs, symptoms, or behaviors consistent with a concussion. The proposed concussion rules enforce the fundamental principle that the medical care and return-to-play decisions for concussions are best handled at the local level as with any other medical conditions.

Pending consideration of the rule change, the committee also revised its guideline in the NCAA Sports Medicine Handbook, advising member institutions on responses to concussion injuries and procedures for returning student athletes to competition or practice. The NCAA will produce a video by fall 2010 to further educate student athletes about the dangers of concussions and approve awareness of the issues among coaches and game officials.

The NCAA sponsored Concussion in Collegiate Sports Summit will also provide an opportunity to explore emerging trends in medical management of concussions. On behalf of the NCAA and its more than 400,000 student athletes, I would like to thank Chairman Conyers for his leadership on this important matter. Mild traumatic brain injuries have and continue to be a significant concern to the NCAA and its membership. The NCAA's long-standing and ongoing commitment to the health and safety of its student athletes is reflected in the comprehensive approach taken to address concerns in this specific injury.

We look forward to the continued work with medical professionals and athletics personnel as we continue to search for new and effective tools to prevent, identify, and treat mild traumatic brain injuries. Thank you.

[The prepared statement of Mr. Klossner follows:]

PREPARED STATEMENT OF DAVID KLOSSNER

STATEMENT OF DAVID KLOSSNER,
NCAA DIRECTOR OF HEALTH AND SAFETY
BEFORE THE
HOUSE COMMITTEE ON THE JUDICIARY
JANUARY 4, 2010

Chairman Conyers, and other distinguished guests in attendance, on behalf of the National Collegiate Athletic Association (NCAA), thank you for inviting me to appear before you today to discuss the NCAA's multi-faceted approach in preventing, identifying and treating Mild-Traumatic Brain Injuries.

My name is David Klossner. I have been with the NCAA for 7 years and currently hold the title Director of Health and Safety. The NCAA Health and Safety unit focuses on student-athlete well-being issues specific to injury surveillance and prevention, sports medicine, athletics training, drug testing and education, nutrition and performance, and NCAA policy related to these matters. I serve as liaison to the NCAA membership committee on Competitive Safeguards and Medical Aspects of Sports, the committee charged with providing leadership on health and safety recommendations to the more than 1,300 conferences, colleges and universities that are members of the Association.

As Director of Health and Safety of the NCAA, I appreciate the opportunity to respond to your request for information on a critical medical issue at the core of student-athlete well-being. The NCAA and its membership have devoted significant resources to study, educate and enforce various health and safety standards, including those in the area of football-related mild traumatic brain injury (MTBI).

Congressman Conyers, I trust you found our October 2009 response pertaining to the health and safety action of the NCAA over the years related to mild traumatic brain injuries useful and timely. We have also included our list of resources and actions as part of our written testimony for reference. You will be interested in learning that since we provided you with the response in October the NCAA has taken additional steps to further ensure student-athlete well-being, and I will expand upon that in a moment.

As you may know, the NCAA is a private association of four-year institutions of higher education and athletics conferences. Each year, more than 400,000 student-athletes compete in 23 sports at these NCAA member schools. Among the core purposes of the Association is a commitment to govern athletics competitions in a manner designed to protect the health and safety of all student-athletes.

Participation in intercollegiate athletics involves unavoidable exposure to an inherent risk of injury. However, student-athletes rightfully assume that those who sponsor intercollegiate athletics have taken reasonable precautions to minimize the risks of injury from athletics participation. The NCAA's health and safety recommendations and policies are addressed through the collaborative efforts of national office staff, governance committees, sport playing rules committees, sport issues committees, and external associations.

Since 1976, the NCAA has warned against using the head as a weapon in football and other contact sports, and for the past 15 years the NCAA has provided member

institutions with specific recommendations regarding concussion management in its Sports Medicine Handbook.

In the sport of football, the NCAA Football Rules Committee has made changes over the past five years to further protect players against sustaining concussions. Starting with the 2005-06 season, rules were strengthened to ban all helmet-first tackles. For the 2007-08 season, the NCAA placed a greater emphasis on eliminating hits on defenseless players and blows to the head. In addition, the Football Rules Committee has distributed several video examples to officials, coaches and conference administrators to educate and clarify what types of plays should result in penalty and ejection.

As part of its ongoing review of concussions, the NCAA Committee on Competitive Safeguards and Medical Aspects of Sports met on December 13-15, 2009, to discuss the most recent developments in athletic-related brain injury and concussion. The committee can make recommendations through the NCAA governance structure on medically related rules and issues. The 20-member committee is comprised of collegiate medical personnel, including physicians; athletics administrators; coaches; and student-athlete representatives.

The committee reviewed the NCAA Injury Surveillance data for fall sports with Dr. Steve Marshall, an epidemiologist-statistician at North Carolina and director of epidemiology and biostatistics at the Datalys Center, which collects and compiles injury data for the NCAA. They also reviewed current policies of the National Federation of State High School Associations, the National Athletic Trainers' Association and the

National Football League and discussed findings of a recent expert conference related to concussions conducted in Zurich, Switzerland.

During its meeting, the committee also consulted with two other authorities who recommended possible courses of action. They are Dr. Julian Bailes, professor and chairman of the department of neurological surgery at West Virginia University, and Dr. Margot Putukian, head team physician at Princeton University and a participant in the Zurich conference who oversaw revisions of the NCAA Sports Medicine Handbook guideline on concussions in 2004.

As an outcome of this on-going evaluation of concussions in all 23 NCAA sports, the committee determined that a common playing rule is necessary to provide an emphasis on the significance of head injuries, their prevalence, and the importance to refer for appropriate medical care. This action is also accompanied by a Concussion in Collegiate Sports Summit that will be held in 2010 to review NCAA policies for medical management of concussions and prevention strategies appropriate to the collegiate environment and the NCAA membership at large. In addition, the committee will lead a collaborative educational initiative for coaches, officials, and student-athletes.

The proposed playing rule, subject to review by the NCAA Playing Rules Oversight Panel as early as mid January, 2010, would mandate removing from competition and practice a student-athlete "who exhibits signs, symptoms or behaviors consistent with a concussion."

That student-athlete would not be permitted to resume participation until cleared by a physician or another health-care professional designated by the physician to provide clearance. If the symptom is a loss of consciousness, amnesia or persistent confusion, the athlete would not be permitted to return to play that day. In the latter case, the rule would specify that only a physician could clear the student-athlete's return to practice or competition.

The proposed concussion rule is similar to the playing rules for all sports pertaining to exposure to blood and charges the sports official to remove a student-athlete if they see a noticeable sign of blood. For example, if an athlete suffers a laceration or wound from which bleeding occurs, the game official has the discretion to summon medical personnel to escort or remove the player from the field of play to be given appropriate medical treatment. The player may not return to the game without approval of medical personnel. The intent of the proposed concussion rules is similar with regard to mandated action by the officials in a contest.

The proposed concussion rule supports a fundamental principle that the medical care and return-to-play decisions for concussions are best handled at the local level as with any other medical conditions. Specifically, the proposed rule change states:

- "An athlete who exhibits signs, symptoms, or behaviors consistent with a concussion (such as unconsciousness, amnesia, headache, dizziness, confusion, or balance problems), either at rest or exertion, shall be immediately removed

from practice or competition and shall not return to play until cleared by a physician or her/his designee."

- "Athletes who are rendered unconscious or have amnesia or persistent confusion shall not be permitted to continue for the remainder of the day. These athletes shall not return to any participation until cleared by a physician."

Pending consideration of the rule change, the committee also revised its guideline in the NCAA Sport Medicine Handbook advising member institutions on responses to concussion injuries and procedures for returning student-athletes to competition or practice.

The revised statement emphasizes:

- It is essential that no athlete be allowed to return to participation when any symptoms persist, either at rest or exertion.
- Any athlete exhibiting an injury that involves significant symptoms, long duration of symptoms or difficulty with memory function should not be allowed to return to play during the same day of competition.
- It has been further demonstrated that retrograde amnesia, post-traumatic amnesia, and the duration of confusion and mental status changes are more sensitive indicators of injury severity; thus, an athlete with these symptoms should not be allowed to return to play during the same day. These athletes should not return to any participation until cleared by a physician.

The committee believes the language reinforces medical policies that already are in place at many NCAA institutions, while encouraging institutions to develop protocols under the direction of a physician for responding to possible concussions.

Knowing that education is paramount to the success of any rule implementation and its enforcement, the NCAA will produce a video by fall 2010 to further educate student-athletes about the dangers of concussions and improve awareness of the issue among coaches and game officials. The video would emphasize best practices for responding to a head injury.

The NCAA-sponsored Concussion in Collegiate Sports Summit will also provide an opportunity to explore emerging trends in medical management of concussions. Topics could include differences in student-athletes' willingness to reveal a possible concussion analyzed by sport and gender; potential equipment enhancements, possible limitations on head contact during practice; uses of tools such as neuropsychological and balance postural testing and biomarkers; complications arising from injury such as depression, anxiety or learning disabilities; and the potential for use of dietary supplements such as DHA and omega 3 fatty acids in injury management and prevention.

The treatment and management of concussions has been and continues to be at the forefront of prevention efforts in sports medicine for the NCAA and its member colleges and universities. The NCAA's ongoing commitment to the health and safety of student-athletes is reflected in the multi-faceted approach taken to address concerns with this specific injury for more than 30 years.

On behalf of the NCAA and its more than 400,000 student-athletes, I would like to thank Chairman Conyers for his leadership on this important matter. Mild Traumatic Brain Injuries have and continue to be of significant concern to the NCAA and its membership. The NCAA's longstanding and ongoing commitment to the health and safety of student-athletes is reflected in the comprehensive approach taken to address concerns with this specific injury. We look forward to the continued work with medical professionals and athletics personnel as we continue to search for new and effective tools to prevent, identify and treat Mild Traumatic Brain Injuries.

Mr. CONYERS. Thanks, Dr. Klossner.

Representing the National Federation of State High School Associations is Bob Colgate, Assistant Director from Indianapolis, Indiana, has a broad set of responsibilities because, as I understand it, your jurisdiction covers all male sports, female sports, football, wrestling, track and field, golf, football, of course, and probably others.

He served as Liaison to the Federation's Sports Medicine Advisory Committee, Wrestling Rules Committee, Football Rules Committee, and the Sports Medicine Advisory Committee. We're pleased that you could be with us today. Welcome.

TESTIMONY OF BOB COLGATE, ASSISTANT DIRECTOR, NATIONAL FEDERATION OF STATE HIGH SCHOOL ASSOCIATIONS

Mr. COLGATE. Thank you, Chairman Conyers and distinguished Members of the Judiciary Committee for the opportunity to testify today on this important issue. I am an Assistant Director of the National Federation of State High School Associations, the NFHS. In my work for the NFHS, I serve as the editor and national rules interpreter for sports and football, wrestling, and staff liaison for our NFHS Sports Medicine Advisory Committee.

Before further discussing head injuries, let me provide some context on the role of the NFHS within the high school community. The NFHS based in Indianapolis, Indiana, is the national leadership organization for high school athletics and performing arts programs in speech, debate, theater, and music. Since 1920, the NFHS has worked with its member state associations on the development of education based interscholastic sports and fine arts activities.

The NFHS sets direction for the future by building awareness and support, improving participation, establishing consistent standards and rules for competition, and helping those oversee high school sports and activities. The NFHS writes voluntary playing rules for 17 sports for boys and girls at the high school level. Through our 51-member state associations, the NFHS reaches more than 19,000 high schools and 11 million participants in activities, in high school activities programs, including more than 7.5 million in high school sports. The NFHS conducts national meetings, produces publications for high school coaches, officials, athletic directors, and serves as the national information resource for interscholastic athletics and activities.

One of our critical functions is to obtain and disseminate health and safety related information. The NFHS Sports Medicine Advisory Committee, SMAC, is one facet of the federation that addresses medical issues relevant to interscholastic athletics, including concussions and concussion management. The membership of the Sports Medicine Advisory Committee includes a number of highly represented physicians and other healthcare providers from around the country.

The SMAC makes recommendations to the NFHS staff and membership about programs and services to the NFHS. The SMAC regularly reviews the latest medical evidence regarding sports related concussions in high school athletes. The past decade has witnessed

significant changes in the management of sports related concussions as new research findings have been published.

As a result, the SMAC has worked with the Centers For Disease Control, CDC, to disseminate concussion management information from the CDC to our Nation's high schools. They've updated the concussion section of our sports medicine handbook and has issued a new NFHS brochure on suggested guidelines for management of concussions in sports. The NFHS has made concussion management a point of emphasis in rule books in recent years. For example, in all rule books for the coming academic year, the NFHS provides that any athlete who exhibits signs, symptoms, or behaviors consistent with a concussion, such as loss of consciousness, headache, dizziness, confusion, or balance problems shall be immediately removed from the contest and shall not return to play until cleared by an appropriate healthcare professional.

The key concussion related issue for the NFHS is to help high school coaches identify the signs and symptoms of concussions so they can direct injured athletes to appropriate healthcare professionals. We can help coaches with concussion recognition. Toward that end, we have extensively circulated printed and online educational materials. Our mission is to continue this important educational process.

In summary, with more than seven and a half million participants in high school sports, minimizing the risk of injury has been and remains one of the chief tasks of our NFHS rules committees. The NFHS Sports Medicine Handbook has a six-page section on dealing with concussions. The third edition of this handbook was distributed to virtually every high school in the country during the 2008-9 school year. The SMAC was also involved with producing the brochure I mentioned entitled Suggested Guidelines For Management of Concussion In Sports.

The issue of concussions is a serious one, and our various medical and sport professionals and experts have been reviewing the subject for a number of years and will continue to monitor developments, but we cannot mandate the adoption of specific treatment protocols at the local level. We continue to provide up-to-date resources to assist NFHS member state associations and high schools in developing policies that are in the best interests of the participants.

Minimizing the risk of injury for high school student athletes has been a foremost priority of the NFHS rules writing process and we'll continue to champion the task in years to come. We would be happy to continue our assistance to the Chairman and Members of the Committee on this issue. I look forward to answering any questions and providing any additional information you require. Thank you.

[The prepared statement of Mr. Colgate follows:]

PREPARED STATEMENT OF BOB COLGATE

Testimony of
Bob Colgate
Assistant Director
National Federation of State High School Associations

Before the House Committee
On
The Judiciary

"Legal Issues Relating to Football Head Injuries, Part II"

Margherio Family Conference Center
Wayne State University
Detroit, Michigan

January 4, 2010
1:00 pm

National Federation of State High School Associations
P.O. Box 690
Indianapolis, Indiana 46206

Introduction

Thank you Chairman Conyers and distinguished Members of the Judiciary Committee for the opportunity to testify today on this very important issue.

My name is Bob Colgate. I am an Assistant Director of the National Federation of State High School Associations (NFHS). Prior to my position at the NFHS I served in a similar capacity for the Nebraska School Activities Association. In my work for the NFHS, I serve as the editor and national rules interpreter for the sports of football and wrestling and staff liaison for the NFHS Sports Medicine Advisory Committee.

Before further discussing head injuries, let me provide some context on the role of the NFHS within the high school community.

The NFHS, based in Indianapolis, Indiana, is the national leadership organization for high school athletics and performing arts programs in speech, debate, theater and music. Since 1920, the NFHS has worked with its member state associations on the development of education-based interscholastic sports and fine arts activities. We believe these activities are an essential part of the high school experience and go a long way to improving academic performance and making better citizens. The NFHS sets direction for the future by building awareness and support, improving the participation, establishing consistent standards and rules for competition, and helping those who oversee high school sports and activities.

The NFHS writes voluntary playing rules for 17 sports for boys and girls at the high school level. Through our 51 member state associations, the NFHS reaches more than 19,000 high schools and 11 million participants in high school activity programs,

including more than 7.5 million in high school sports. The NFHS conducts national meetings, sanctions interstate events; produces publications for high school coaches, officials and athletic directors; sponsors professional organizations for high school coaches, officials, spirit coaches, speech and debate coaches and music adjudicators; and serves as a central national information resource for interscholastic athletics and activities. One of our critical functions is to obtain and disseminate health and safety-related information. The Sports Medicine Advisory Committee (SMAC) is one facet of the Federation that addresses the medical issues relevant to interscholastic athletics, including concussions and concussion management.

The membership of the Sports Medicine Advisory Committee includes a number of highly respected physicians and other health care providers from around the county. The SMAC makes recommendations to the staff and membership about programs and services of the NFHS. The goals of the SMAC include:

- Working with our rules-writing committees to address sports medicine issues as they impact high school rules and the health and risk management of high school athletes.
- Maintaining contact with other key medical and paramedical organizations, including the CDC, that provide essential information on sports medicine issues.
- Recommending that NFHS or the NFHS Foundation fund sports medicine research projects.
- Developing position statements and guidelines that will help the NFHS leadership and membership in making informed decisions that contribute to minimizing risk for participants.

- Supporting a national high school sports injury surveillance system. The SMAC analyzes and interprets the scientific injury data that is obtained from various sources. This information helps the SMAC to initiate and support recommendations to the NFHS community intended to reduce risk through possible changes in rules and/or equipment.
- Providing the NFHS leadership and membership with current information on sports medicine issues through the NFHS Sports Medicine Handbook, the Sports Medicine section of the NFHS website and other NFHS publications.

The SMAC regularly reviews the latest medical evidence regarding sports-related concussions in high school athletes. The past decade has witnessed significant changes in the management of sports-related concussions as new research findings have been published. As a result the SMAC has worked with the CDC to disseminate concussion management information from the CDC to the nation's high schools, has updated the Concussion section of our Sports Medicine Handbook and has issued a new NFHS brochure on "Suggested Guidelines for Management of Concussions in Sports". A copy was provided to the Committee in early December.

The NFHS has made concussion management a point of emphasis in rule books in recent years. For example, in all rule books for the coming academic year, the NFHS provides that: Any athlete who exhibits signs, symptoms, or behaviors consistent with a concussion (such as loss of consciousness, headache, dizziness, confusion or balance problems) shall be immediately removed from the contest and shall not return to play until cleared by an appropriate health care professional. We included suggested guidelines for the Management of Concussions. We define a concussion as a traumatic

brain injury that interferes with normal brain function. An athlete does not have to lose consciousness (be "knocked out") to have suffered a concussion. Further we list common symptoms as headache, fogginess, difficulty concentrating, easily confused, slowed though processes, difficulty with memory, nausea, lack of energy, tiredness, dizziness, poor balance, blurred vision, sensitive to light and sound and mood changes, irritability or anxious. Our suggestions with respect to concussion management include;

- No athlete should return to play or practice on the same day of a suspected concussion.
- Any athlete suspected of having a concussion should be evaluated by an appropriate healthcare professional that day.
- Any athlete with a concussion should be medically cleared by an appropriate healthcare professional prior to resuming participation in any practice or competition.
- After medical clearance, return to play should follow a step-wise protocol with provisions for delayed return to play based upon return of any signs or symptoms.

I mentioned earlier that part of the SMAC activities is to use the information from the National High School Sports-Related Injury Surveillance Study that has been conducted for the last four years by Ohio State University. The NFHS assists in funding the study. The initial study was of athletes participating in nine sports, including football, soccer, basketball, wrestling, baseball, volleyball and softball. The data compiled over this four year study now represents the largest data-set of all time-loss sports injuries from a national sample of US high school athletes.

The study has now been expanded to include nine more sports, boys' lacrosse, ice hockey, swimming and diving and track & field and girls' field hockey, gymnastics, lacrosse and swimming and diving and track & field. The survey is funded by the NFHS, the National Operating Committee on Standards for Athletic Equipment (NOCSAE) and a research grant from CDC's National Center for Injury Prevention and Control. The data is collected by Dr. Dawn Comstock at Ohio State University.

Information from the SMAC, from the CDC and from Ohio State and the University of North Carolina, as valuable as it has been, is only part of the effort that the NFHS has put into injury minimization in the sport of football. The NFHS football rules committee has a subcommittee that is specifically charged with examining the sport from an injury minimization standpoint. As a consequence of the subcommittee's work, the NFHS was the first rule maker to outlaw blocks below the waist, and was also the first to outlaw the running of kickoffs out of the end-zone. Both changes appear to have achieved their purpose of reducing the incidence of head and neck injuries.

In summary, with more than 7 ½ million participants in high school sports, minimizing the risk of injury has been and remains one of the chief tasks of our rules committees. The NFHS Sports Medicine Handbook has a six-page section on dealing with concussions. The third edition of this Handbook was distributed to virtually every high school in the country during the 2008 -2009 school year. The SMAC was also involved with producing the brochure I mentioned entitled "Suggested Guidelines for Management of Concussion in Sports."

The issue of concussions is a serious one, and our various medical and sport professionals and experts have been reviewing the subject for a number of years and will

continue to monitor developments. While we cannot mandate the adoption of specific treatment protocols at the local level, we continue to provide up-to-date resources to assist NFHS member state associations and high schools in developing policies that are in the best interests of the participants.

Minimizing the risk of injury for high school student athletes has been a foremost priority of the NFHS rules-writing process, and we will continue to champion that task in the years to come.

As you know, last month our Executive Director, Robert Kanaby wrote Chairman Conyers with answers to questions about our work in concussion management. At that time we also provided the Committee with a number of supporting documents about our work in this area.

We would be happy to continue our assistance to the Chairman and members of the Committee on this issue, and I look forward to answering any questions and providing any additional information that you require.

Mr. CONYERS. Thank you, Mr. Colgate.

Scott Hallenbeck has led USA Football, the national governing body on this sport at the youth and amateur levels since 2005. He covers all aspects, football development, communications, corporate partnerships, membership programs, and the organization has built senior and junior national teams for international competition, produced industry leading resources to further strengthen coaching and officiating within America's football system, established a half-million-dollar-per-year equipment and grant program, kicked off a groundbreaking volunteer youth coach background check program to ensure that we get as much positive football experience as possible.

A couple years ago they established coaching, officiating, and commission membership programs, including the certified coaching education program which conducts 40 full-day youth football coaching schools in more than 30 states. He's done a great deal of work in this area, and he's President of the Pan American Federation of Sports. Mr. Hallenbeck, we're pleased that you're with us today.

TESTIMONY OF SCOTT HALLENBECK,
EXECUTIVE DIRECTOR OF USA FOOTBALL

Mr. HALLENBECK. Thank you very much. Thank you, Chairman Conyers, Congresswoman Sánchez, and Congressman Cohen for having me here today. Three million American youngsters, aged 6 to 14, and some 500,000 adult volunteers comprise youth football, making it one of our country's most popular youth sports. USA Football is the sports national governing body in youth and amateur levels. We're an independent nonprofit with members in all 50 states and the District of Columbia.

Our members are youth football coaches, players, league commissioners, and game officials. We lead the sports development and serve the youth football community. A critical part of that leadership is the health and safety information we provide, including our work with the CDC on concussion awareness.

USA Football has worked with the CDC for more than 2 years to share concussion awareness information throughout youth football, and we will do so with even greater emphasis in 2010. I'd like to briefly share some background with you on youth football.

Youth football has likely never been stronger or more popular than it is right now. Like most all youth sports, it is dependent upon committed volunteers. The amount of time that they have to learn how to teach this game's fundamentals and techniques is limited. Youth football is fragmented. Conservatively, 80 percent of leagues are independent and community based.

With such variance in structure, football and every youth sport needs clear, concise safety standards so that volunteers can comprehend the critical information like concussion awareness. This is what we're doing for football in partnership with the CDC and others. We encourage youth sports leagues, not only those pertaining to football, to adopt our CDC-approved concussion awareness and management policy which is found in my written testimony.

Succinctly stated, this covers educating athletes and parents about concussion, informing coaches, parents and athletes of concussion signs and symptoms, and what to do if a concussion is even

suspected. When in doubt, sit them out is a CDC approved guideline that we stress. Just as important is an athlete who endures a concussion can only return to play after an appropriate healthcare professional clears his or her return. In some, returning to play must be a medical decision.

This information is prominently posted on our website, usafootball.com, and will be distributed to tens of thousands of coaches during 85 training events in 27 states and through our membership programs. Our events, online education programs, and resources for coaches provide a strong knowledge base. No physical activity is injury proof, but having coaches who know how to teach tackling and blocking fundamentals would likely lessen the chance of injury.

More than 26,000 youth coaches have completed our primary online coaching course since May of 2008. By this coming April, this eleven-chapter course will be bolstered with new chapters on concussion awareness, athlete hydration, and even equipment failure. Every chapter is followed by a quiz strengthening comprehension, and that's the critical point, strengthening comprehension. To successfully complete the course, a coach must be reach a cumulative quiz score of 80 percent.

USA Football's commitment to keeping the sport safe is also demonstrated through our equipment grant program. From this past November through February of this year alone, we will award a million dollars' worth of new helmets and other football equipment to more than 800 youth and high school programs in 44 states based on need and merit.

Concussion related legislation in youth sports exists. A coalition of Washington State health providers and the CDC helped pass a State law there this past May that mirrors much of our suggested policy for youth leagues. The American College of Sports Medicine has joined forces with that Washington coalition to pass similar laws at State or Federal levels. USA Football supports such legislation, and we hope that other sports national governing bodies will join us. All youth sports need to recognize the seriousness of concussions and the need for further education among our coaches, the administrators, game officials, athletes and parents.

I thank you, and I'd be happy to answer any questions at this time.

[The prepared statement of Mr. Hallenbeck follows:]

PREPARED STATEMENT OF SCOTT HALLENBECK

Testimony of

Scott Hallenbeck
Executive Director
USA Football

Before the House Committee on the Judiciary

"Legal Issues Relating to Football Head Injuries, Part II"

January 4, 2010

Chairman Conyers and Members of the Committee:

My name is Scott Hallenbeck. I am the executive director of USA Football, the sport's national governing body on youth and amateur levels.

Approximately 3.0 million American youngsters aged 6-14 and 500,000 adult volunteers power youth tackle football, making it one of our country's most popular youth sports. USA Football is an independent non-profit organization with members residing in all 50 states and the District of Columbia. Our members are youth football coaches, players, league commissioners and football game officials. Within our spectrum of responsibility is to lead and serve the youth football community. We do this in several ways, including giving information in the area of health and safety through our work with the Centers for Disease Control and Prevention (CDC).

USA Football was endowed by the National Football League (NFL) and the NFL Players Association (NFLPA) in 2002 through the NFL Youth Football Fund. The NFL Youth Football Fund is a non-profit foundation created by the NFL and NFLPA in 1998. I have served as USA Football's executive director since 2005.

Twenty-six (26) youth sports organizations, including USA Football, have worked with the CDC for more than two years to educate the youth sports community on concussion awareness and management. USA Football will continue to make this a point of emphasis in 2010. In fact, USA Football's CDC-approved 2010 concussion awareness work has already garnered national media attention through a news story written by *The Associated Press* on December 15, 2009. This underscores the public's thirst for additional knowledge and education on this topic.

Summary of USA Football's CDC-Approved Concussion Awareness Information

USA Football's coaching education curriculum, football training events, and resources provide youth football players, parents, coaches, league commissioners, and game officials with a strong knowledge base of football's fundamentals. Although no physical activity is injury-

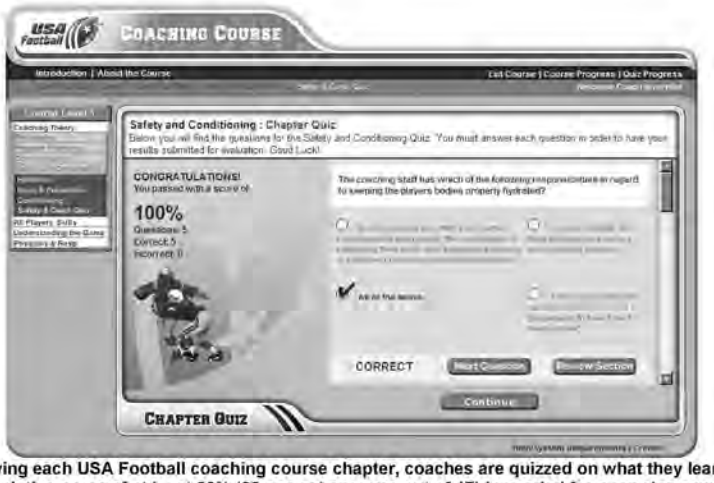
proof, coaches who understand how to properly teach blocking and tackling within the rules will foster a positive football experience and will likely lessen the chance of injury.

The following summarizes how USA Football, with CDC-approved practices, educates the youth football community on how to recognize a concussion and how to respond if one occurs. This information is promoted on our website – www.usafootball.com – and will be covered at USA Football's 2010 training events.

By April 2010, USA Football will add four new chapters to our online youth football coaching course, which presently is composed of 11 chapters and takes approximately two hours to complete. These four new chapters will cover concussion awareness, athlete hydration, equipment-fitting guidelines, and basic football stances. Each new chapter will be followed by a quiz. Every chapter at present is followed by a quiz to strengthen comprehension, results of which can be tracked by a league's commissioner. To successfully complete the course, coaches must correctly answer at least 80% (38) of the 47 quiz questions. More than 26,000 youth football coaches have successfully completed the course since May 2008.

Screen shots from USA Football's online coaching course:

USA Football's online coaching course, successfully completed by more than 26,000 youth football coaches since May 2008, teaches how to properly coach football fundamentals.



Following each USA Football coaching course chapter, coaches are quizzed on what they learned. A cumulative score of at least 80% (38 correct answers out of 47) is needed for a passing grade.

Youth sports leagues – not only those pertaining to football – are encouraged to adopt USA Football's CDC-approved concussion awareness and management policy (below). USA Football recommends that every youth sports league employs a policy such as this:

Prevention and Preparation for Coaches (Primary Source: CDC)

1) *Educate athletes and parents about concussion*
   a) Talk with athletes and parents about preventative measures, symptoms, and proper action to take relative to concussions.
   b) Emphasize the dangers of playing through a concussion.
2) *Insist that safety comes first*
   a) Teach athletes safe playing techniques and good sportsmanship
   b) Review the "Concussion Fact Sheet for Players" found at usafootball.com with players and their parents
3) *Teach athletes and parents that it is not safe to play with a concussion*
   a) Explain that it is not "courageous" nor does it show strength to play with a concussion
4) *Prevent long-term problems*
   a) "When in doubt, sit them out." Keep athletes with known or suspected concussion off the field until an appropriate health care professional clears them to return. Returning to play must be a medical decision.

Signs & Symptoms of Concussion (Primary Source: CDC)

Observations made by Coaching Staff
- Appears dazed or stunned
- Is confused about assignment or position
- Forgets plays
- Unsure of game, score, or opponent
- Loses consciousness (even briefly)

Symptoms reported by Athlete
- Headache or "pressure" in the head
- Nausea or vomiting
- Balance problems or dizziness
- Double or blurry vision
- Sensitivity to light or noise

- ❖ Shows behavior or personality changes
- ❖ Can't recall events prior or after the hit or fall
- ❖ Feeling sluggish, hazy, foggy, or groggy
- ❖ Concentration or memory problems

What a Coach Should Do When a Concussion is Suspected (Primary Source: CDC)

1) *Remove the athlete from play*
   a) Look for signs and symptoms of concussion if an athlete experienced a bump or blow to the head
   b) "When in doubt, sit them out" – athletes with signs or symptoms of concussion must not return to play
2) *Ensure that the athlete is evaluated immediately by an appropriate health care professional*
   a) Do not try to judge the severity of the injury yourself
   b) Coaches recording the following can help a health care professional in assessing the athlete:
      i) Cause of the injury and the force of the hit or blow to the head
      ii) Any loss of consciousness and if so, for how long
      iii) Any memory loss or seizures immediately following the injury
      iv) Number of previous concussions (if any)
3) *Inform the athlete's parents/guardians of the possible concussion and give them the concussion fact sheet for parents found on usafootball.com*
   a) Ensure that parents know the athlete must be seen by an appropriate healthcare professional
   b) Provide formal documentation of the injury and notify the league commissioner
4) *Allow the athlete to return to play only after an appropriate healthcare professional clears his or her return*
   a) A repeat concussion that occurs before the brain recovers from the first can slow recovery or increase the likelihood of having long-term problems

USA Football Educational Resources & Initiatives

The following outlines USA Football's educational resources and initiatives, including information distribution channels.

EDUCATION

- **USA Football Events**: Knowing the game's fundamentals and how to teach them fosters a positive football experience
  - USA Football Coaching Schools: youth coaches are instructed how to teach the sport's fundamentals properly
  - USA Football Player Academies: youth players (aged 7-14) are taught proper football fundamentals
  - USA Football State Leadership Forums: commissioners learn best practices, including insight on concussion
    - All three of these events educate participants on important health and safety issues, including concussion awareness through CDC-authored material. **USA Football stresses that athletes who have or are suspected to have suffered a concussion must not return to play until an appropriate healthcare professional clears them to do so**.

- **USA Football's Online Coaching Education Program for Youth Tackle and Flag Football**
  - USA Football is adding concussion awareness content and quizzes to its online football coaching course by April 2010
    - USA Football's concussion-related course content is created by its Football & Wellness Committee, the CDC, and the National Athletic Trainers' Association (NATA)
    - USA Football's Football & Wellness Committee is composed of experts in several areas, including player health, hydration, and nutrition
  - USA Football's coaching education course presently includes 11 chapter quizzes, each of which consists of 10 questions. A cumulative score of at least 80% is needed for successful completion.
    - Youth league commissioners can track and confirm coaches' course completions
    - More than 26,000 youth football coaches have completed this course since May 2008

- **National Federation of State High School Associations (NFHS) "Fundamentals of Coaching Football" Course**

- Produced by USA Football, this course teaches proper coaching fundamentals to America's high school football coaches
- High school head football coaches in the Commonwealth of Massachusetts are mandated by the Massachusetts Interscholastic Athletic Association to successfully complete the NFHS's three-part online coaching curriculum; USA Football's coaching course accounts for one of these three parts.

RULES

- **USA Football Youth Football Rulebook**
  - USA Football has written a youth football rules book with assistance from the National Association of Sports Officials (NASO) and the NFHS to establish important youth football standards
  - The USA Football Youth Football Rulebook was distributed to more than 450 youth football league commissioners and beta-tested in 2009 in Northern Virginia. The rulebook will be available on a national basis in 2010.

RESEARCH

- **Annual Participation and Player Health Studies**
  - USA Football continues youth football's most accurate participation study monitoring players, coaches, and teams
  - USA Football will invest annually to execute a study to learn more about youth football injury rates and how they are affected by different standards of play (Age & Weight, Age and Grade-based)

CONTENT DISTRIBUTION IN 2010

- USA Football State Leadership Forums: educate 500-plus youth football league commissioners with CDC-authored material
- USA Football Coaching Schools: distribute and review CDC-authored material to more than 5,000 youth coaches
- Player Academies: distribute and review CDC-authored material with youth players and parents
- usafootball.com continues to share a range of important health and safety news for players, parents and coaches

USA Football Equipment Grant Program

USA Football, through financial support provided by the NFL Youth Football Fund, has awarded more than $2 million in football equipment based on merit and need to youth and high school programs across the United States since 2006. More than 800 youth and high school football programs in 44 states will be assisted through USA Football grants awarded from November 2009 through February 2010 alone.

USA Football equipment grants make youth and high school football safer and compliments programs' existing fundraising endeavors for new equipment. Selected youth leagues choose one of 12 equipment packages, each valued at $1,000. Selected high school programs also choose one of 12 packages, each valued at $1,500. Equipment and apparel grants are fulfilled by USA Football national partners.

Dozens of football program leaders have expressed appreciation for our equipment grants:

"This is going to enable a lot more kids to play. This grant keeps kids on the field. It'll definitely help us and we are so very grateful."

--Cassandra Jetter-Ivey, Newark (N.J.) North Ward Scorpions Youth Football Program

"We appreciate USA Football's help. This allows a sense of relief that we're keeping our children safe from injury by placing them in new and sturdier helmets. Since we are supporting children who are predominately underprivileged, this assistance is especially valuable as it keeps our registration fees as low as possible."

--DeAndrea Singleton, Westbury Redskins; Houston, Texas

"The equipment grant we were awarded from USA Football will provide equipment and uniforms to young athletes in low-income, inner-city neighborhoods. Most of the youths are between the ages of 5-12 years and the majority of them are financially disadvantaged. USA Football helps us make a difference in the lives of our kids and we appreciate their non-profit office's support."

--Steve Billingslea, Middle Tennessee Bulldogs; Nashville, Tenn.

USA Football's Football and Wellness Committee

USA Football has assembled a Football and Wellness Committee to further promote best practices for America's youth football community. The committee, composed of 17 experts spanning football coaching, player health, and other areas, will share insight starting in the first quarter of this year with youth football coaches, game officials, league commissioners, youth players, and parents to lead the game's development and foster a positive football experience for youth and amateur players. The committee's expertise will be shared with USA Football members through www.usafootball.com, our quarterly *USA Football Magazine*, and our football training events, which are conducted in more than two dozen states.

This committee roster represents a variety of organizations including the American Red Cross, the Andrews Institute, the National Center for Sport Safety, and several medical centers from across the United States. USA Football's Football & Wellness Committee Members:

NAME	EXPERTISE	ORGANIZATION
Tom Bass	Coaching Expert	USA Football
Dr. Jody Brylinsky	Coaching Performance/Sport Studies	Western Michigan University
Ron Courson	Sports Medicine	University of Georgia
Ted Crites	CPR	American Red Cross
Dr. Ann Grandjean	Nutrition	University of Nebraska Medical Center
Dr. Brad Hatfield	Kinesiology	University of Maryland
Dr. Stan Herring	Concussion	University of Washington
Dr. David Joyner	Medical Expert	Penn State University
Dr. John Lehtinen	Family Medicine	Upper Peninsula (Mich.) Medical Center
Dr. Larry Lemak	Medical Expert	National Center for Safety Initiatives
George Maczuga	Football Equipment & Equipment Fitting	Riddell Sports Group, Inc.
Dr. Joel Morgenlander	Neurology	Duke University Medical Center
Dr. Lonnie Paulos	Orthopedics	The Andrews Institute
Mike Price	Insurance	ESIX, Inc.
Kim Schwabenbauer	Nutrition	Super Bakery
Dr. JohnEric Smith	Hydration	Gatorade Sports Science Institute
Dr. David Yukelson	Cognitive Development	Penn State University

Concussion-Related Education

USA Football works with the CDC to promote concussion-related education materials for its members and the entire youth football community at www.usafootball.com. In addition to the CDC, USA Football is advised by Dr. Stanley Herring on concussion awareness and management. Dr. Herring is a member of USA Football's Football & Wellness committee and is a board-certified physical medicine and rehabilitation specialist who has been in practice for more than 27 years. Dr. Herring also is a clinical professor in the departments of Rehabilitation Medicine, Orthopaedics & Sports Medicine, and Neurological Surgery at the University of Washington.

Dr. Herring is USA Football's internal advisor on concussion awareness material for our coaching course, which is shared with the CDC for review prior to being made available to the youth football community. USA Football informs coaches of the CDC-approved message that athletes who are even *suspected* of having suffered a concussion must not return to play until an appropriate health care professional clears them to return. Returning to play must be a medical decision.

USA Football's State Leadership Forums invite youth football leaders – primarily league commissioners – from throughout a region to meet annually for approximately six hours to discuss and share best practices for the sport's betterment. At least 500 youth football league

leaders will attend USA Football's 38 state forums in 2010. Each state forum participant will receive a CDC-authored information packet with concussion-related fact sheets, a coach's clipboard, and a concussion awareness and management magnet. Screened onto the clipboard and magnet are concussion signs and symptoms, action steps to be taken if a player is suspected to have suffered a concussion, and a designated space for important phone numbers, such as local hospitals.

USA Football Coaching Schools are full-day coaching clinics designed exclusively for youth football coaches. USA Football will conduct 37 of these events in 2010, drawing a cumulative attendance of more than 5,000 coaches. Each coach in attendance will receive a clipboard sticker created jointly by USA Football and the CDC mirroring the concussion awareness information screened onto the CDC-created clipboards at our state forums.

Ten (10) USA Football Player Academies are scheduled for this summer (2010). These three-day player camps are designed for youth players aged 7-14. During each academy's orientation session on the camp's first day, with parents invited to be present, USA Football will discuss concussion awareness and distribute two concussion fact sheets – one for youth athletes and another for youth sports parents. Both fact sheets were created by the CDC and are available through usafootball.com.

Youth Football Injury Research

Due to several factors, including youth football's fragmented landscape, youth football injury research is scant. Beginning with the 2010 football season, USA Football will invest annually to learn more about youth football injury rates and study how these rates are affected by different standards of play (age & weight, age & unlimited weight, grade-based, etc.). Parameters of this 2010 study will be promoted by USA Football once they are determined.

Existing Legislation

On May 14, 2009, through the work of a coalition comprised of the Brain Injury Association of Washington (BIAWA), the University of Washington, Harborview Medical Center,

Seattle Children's Hospital, the CDC, and other partners in sports and medicine, a new Washington state law was passed to protect young athletes from death or disability caused by premature return to play following a concussion.

The Lystedt Law is named in honor of Zackery Lystedt, a Seattle-area youngster who when he was 13 years old in 2006 suffered a concussion during a middle school football game. After returning to the same game, he later collapsed on the field suffering from a brain hemorrhage.

The American College of Sports Medicine has joined forces with the Washington state coalition partners mentioned above to advocate for legislation similar to the Lystedt Law on state or national levels that can work to require:

- Information handouts to parents and players on the signs and symptoms of concussion; returned and signed by parents and youth athletes acknowledging the risk of concussion and head injuries prior to practice or competition.
- Removal of a youth athlete who is suspected of or sustains a concussion or head injury from play – "When in doubt, sit them out."
- Written clearance prior to returning to play from a licensed health care provider knowledgeable in the diagnosis and management of concussion for a youth athlete who has been removed from play.
- Compliance from private, non-profit youth sports associations with the policies adopted in that state.

Laws like this one cannot stop an initial concussion from happening on a football or soccer field, a basketball court, a baseball diamond, or a hockey rink, but they can help keep damaging repeated concussions from happening in all of these places.

USA Football supports this legislation. We are interested to be part of a larger concussion awareness and management alliance for the betterment of America's youth sports and would encourage other sports' national governing bodies to join us.

Concussion is not relegated to football – or even boys' athletics. According to a study titled, "Concussions Among United States High School and Collegiate Athletes" in the Journal of Athletic Training in 2007, concussion rates per 1,000 athlete exposures were as follows (an "athlete exposure" is one practice or one game):

- Football: 0.47
- Girls Soccer: 0.36
- Boys Soccer: 0.22
- Girls Basketball: 0.21
- Boys Basketball: 0.07

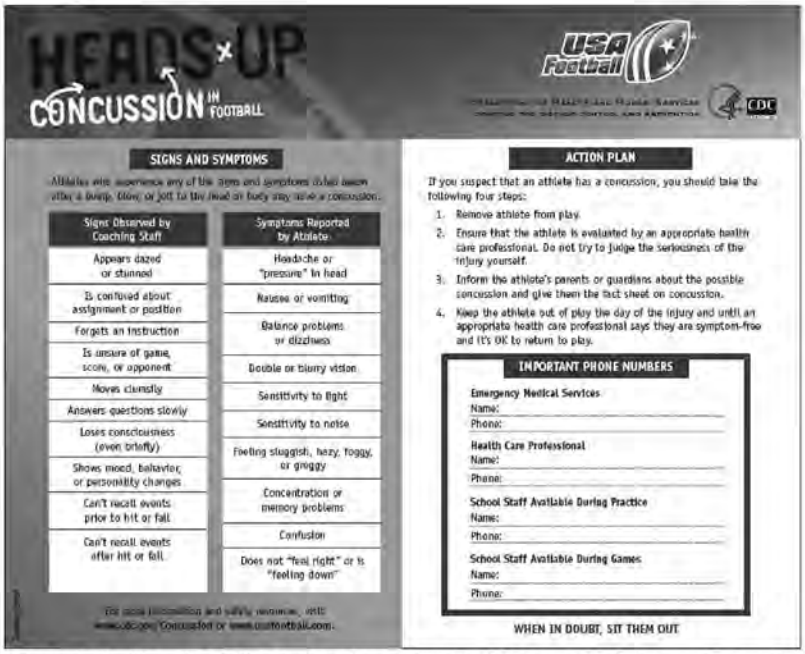
These numbers underscore the need for all sports to recognize the seriousness of concussions and the need for further education among our coaches, league administrators, game officials, athletes, and parents.

More Education Needed

Concussion awareness, even within the medical community, is limited. I was recently alerted to the fact that the CDC has created a concussion fact sheet for doctors. This drives the point that consistent nomenclature and the coordinated cooperation of all youth sports stakeholders is necessary to continue this positive change that we are experiencing in youth sports relative to concussion.

Thank you for inviting me to appear here today. I am pleased to answer any questions.

APPENDIX



HEADS UP
CONCUSSION IN FOOTBALL

USA Football

CDC

SIGNS AND SYMPTOMS

Athletes who experience any of the signs and symptoms listed below after a bump, blow, or jolt to the head or body may have a concussion.

Signs Observed by Coaching Staff	Symptoms Reported by Athlete
Appears dazed or stunned	Headache or "pressure" in head
Is confused about assignment or position	Nausea or vomiting
Forgets an instruction	Balance problems or dizziness
Is unsure of game, score, or opponent	Double or blurry vision
Moves clumsily	Sensitivity to light
Answers questions slowly	Sensitivity to noise
Loses consciousness (even briefly)	Feeling sluggish, hazy, foggy, or groggy
Shows mood, behavior, or personality changes	Concentration or memory problems
Can't recall events prior to hit or fall	Confusion
Can't recall events after hit or fall	Does not "feel right" or is "feeling down"

For more information and safety resources, visit: www.cdc.gov/Concussion or www.usafootball.com.

ACTION PLAN

If you suspect that an athlete has a concussion, you should take the following four steps:

1. Remove athlete from play.
2. Ensure that the athlete is evaluated by an appropriate health care professional. Do not try to judge the seriousness of the injury yourself.
3. Inform the athlete's parents or guardians about the possible concussion and give them the fact sheet on concussion.
4. Keep the athlete out of play the day of the injury and until an appropriate health care professional says they are symptom-free and it's OK to return to play.

IMPORTANT PHONE NUMBERS

Emergency Medical Services
Name:
Phone:

Health Care Professional
Name:
Phone:

School Staff Available During Practice
Name:
Phone:

School Staff Available During Games
Name:
Phone:

WHEN IN DOUBT, SIT THEM OUT

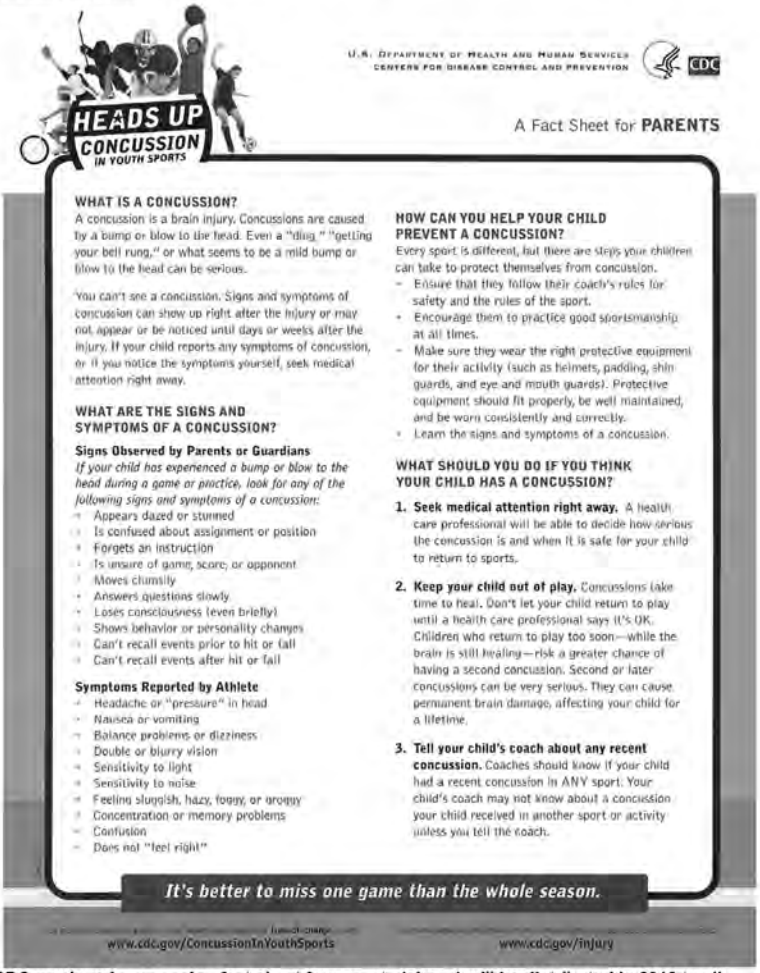
USA Football will conduct 37 full-day Coaching Schools in 25 states in 2010, designed for youth football coaches. Each coach will receive this clipboard sticker regarding concussion awareness and management, created by USA Football and the CDC. USA Football anticipates more than 5,000 youth football coaches to attend its 2010 Coaching Schools.

This same information, screened onto 9" x 13" clipboards and 6" x 8.25" refrigerator magnets, will be given to youth football league commissioners and administrators at USA Football's 38 State Leadership Forums in 2010, spanning 27 states.

APPENDIX (con't)

USA Football will conduct 10 three-day Player Academies in 2010 in nine states. These are football clinics for youth players aged 7-14. During an orientation session on the event's first day, which parents may attend, each youngster will receive this CDC-produced concussion fact sheet for athletes. The document's reverse side displays this information in Spanish.

This fact sheet will also be included in a CDC-produced concussion awareness information kit, distributed to all USA Football State Leadership Forum attendees in 2010 (38 events in 27 states).
APPENDIX (con't)



HEADS UP
CONCUSSION
IN YOUTH SPORTS

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention
CDC

A Fact Sheet for **PARENTS**

WHAT IS A CONCUSSION?

A concussion is a brain injury. Concussions are caused by a bump or blow to the head. Even a "ding," "getting your bell rung," or what seems to be a mild bump or blow to the head can be serious.

You can't see a concussion. Signs and symptoms of concussion can show up right after the injury or may not appear or be noticed until days or weeks after the injury. If your child reports any symptoms of concussion, or if you notice the symptoms yourself, seek medical attention right away.

WHAT ARE THE SIGNS AND SYMPTOMS OF A CONCUSSION?

Signs Observed by Parents or Guardians

If your child has experienced a bump or blow to the head during a game or practice, look for any of the following signs and symptoms of a concussion:

- Appears dazed or stunned
- Is confused about assignment or position
- Forgets an instruction
- Is unsure of game, score, or opponent
- Moves clumsily
- Answers questions slowly
- Loses consciousness (even briefly)
- Shows behavior or personality changes
- Can't recall events prior to hit or fall
- Can't recall events after hit or fall

Symptoms Reported by Athlete

- Headache or "pressure" in head
- Nausea or vomiting
- Balance problems or dizziness
- Double or blurry vision
- Sensitivity to light
- Sensitivity to noise
- Feeling sluggish, hazy, foggy, or groggy
- Concentration or memory problems
- Confusion
- Does not "feel right"

HOW CAN YOU HELP YOUR CHILD PREVENT A CONCUSSION?

Every sport is different, but there are steps your children can take to protect themselves from concussion.

- Ensure that they follow their coach's rules for safety and the rules of the sport.
- Encourage them to practice good sportsmanship at all times.
- Make sure they wear the right protective equipment for their activity (such as helmets, padding, shin guards, and eye and mouth guards). Protective equipment should fit properly, be well maintained, and be worn consistently and correctly.
- Learn the signs and symptoms of a concussion.

WHAT SHOULD YOU DO IF YOU THINK YOUR CHILD HAS A CONCUSSION?

1. **Seek medical attention right away.** A health care professional will be able to decide how serious the concussion is and when it is safe for your child to return to sports.
2. **Keep your child out of play.** Concussions take time to heal. Don't let your child return to play until a health care professional says it's OK. Children who return to play too soon—while the brain is still healing—risk a greater chance of having a second concussion. Second or later concussions can be very serious. They can cause permanent brain damage, affecting your child for a lifetime.
3. **Tell your child's coach about any recent concussion.** Coaches should know if your child had a recent concussion in ANY sport. Your child's coach may not know about a concussion your child received in another sport or activity unless you tell the coach.

It's better to miss one game than the whole season.

www.cdc.gov/ConcussionInYouthSports www.cdc.gov/injury

A CDC-produced concussion fact sheet for parents (above) will be distributed in 2010 to all parents who attend a USA Football Player Academy orientation session as well as youth football leaders who attend USA Football's State Leadership Forums. The document's reverse side displays this information in Spanish.

CDC-produced concussion awareness fact sheets, designed for youth sports coaches, athletes, and parents, are accessible through USA Football's website, www.usafootball.com. More than 850,000 unique visitors were drawn to usafootball.com in 2009.

Mr. CONYERS. Thanks, Mr. Hallenbeck.
Lem Barney, welcome.
Mr. BARNEY. Thank you.
Mr. CONYERS. We've got so many stats on you.
Mr. BARNEY. Don't call them all.

Mr. CONYERS. I'll just put—don't worry, I won't.

Mr. BARNEY. Love you, too.

Mr. CONYERS. I'll put them all in the record. You've been named all NFL in '68 and '69, all NFC in '72-'75, you are—have been a double/triple threat, kickoff return, punt return, interception, tailback. We'll let the record speak for itself. We're glad that you're with us today, and we welcome any reflections that you have on this important subject.

TESTIMONY OF LEMUEL BARNEY,
DETROIT LIONS HALL OF FAME PLAYER

Mr. BARNEY. Thank you very much for this great opportunity, Representative Conyers, to Chairperson Sánchez, and to Chairman Cohen, and to other members of the House Judiciary Committee, to the panel, to my former teammates that's in attendance, and to all the attendees, I am Lem Barney, and prior to becoming a minister, I played professional football for the Detroit Lions for 11 seasons and was inducted into the Professional Football Hall of Fame in 1992. I began playing football in 1959 at Sturgis Junior in San Bernadino, California. After playing high school football in Gulfport, Mississippi, I attended Jackson State University where I was three times all-SWAC player.

I thank you again for inviting me to testify at this hearing. I also want to thank the Committee for bringing awareness to the important issue of brain injuries in professional football. When I played in the sixties and the seventies, we did not have the same level of awareness that we do now. And we would not—and I repeat—we should not repeat the mistakes of the past. I played football for a total of 20 years, and concussions have always been a part of the game.

I've had several concussions myself. The first concussion that I remember was the result of a knee from Rufus Mays of the Cincinnati Bengals, six-nine, 285, a knee to the earhole of my helmet while playing the game. I was out on the field for 20 minutes before moving to the sideline and later returning to play.

The next concussion that I recall was the result of me becoming privy to the high-knee action that made Gale Sayers the running back that we all know today, and the final concussion that I remember was from Robert Newhouse of the Dallas Cowboys, known for his powerful running style. In each incident, I returned to play immediately.

Sure, there was examination done by the trainer or the team physician on the sideline, and there were general questions I asked of players that experienced concussions, questions like "How many fingers am I holding up," and "What day of the week is it," but in reality, the ultimate decision to return to the game rested on the desire of the player and sometimes the coach.

Hindsight tells us that we should not have returned to play based on those factors alone. New research into the effects of these injuries tell us that returning to play may not have been in our best interests and more than likely made us more susceptible to further injury. Back then, as I'm sure the case for some players now, guys just wanted to play the game. I have witnessed guys return to the game and seeing firsthand how they reacted to their in-

jury. Players would exhibit signs of wooziness and imbalance but still in some instances be allowed to retake the field.

As I said before, hindsight tells us that those players would have probably been better off not returning. Thankfully, the decision is moving closer to the hands of an independent third party. The committee of the National Football League Players Association should be applauded for raising the public awareness of this issue, and in particularly, I want to note that the Players Association's new Player Concussions Committee will ensure the future of generations of players and provide with them the knowledge to make the best possible decision.

I am delighted and encouraged to see players taking the initiative and exerting control over their personal welfare. I would also like to commend the NFL on the league's new policy to restrict the return of players who have experienced concussions and other brain injuries. Football is a great sport, and was—I repeat—was one of my favorite passions. But no sport should endanger the lives of its participants. This holds true for all levels of football from pee wees to professionals.

I have never coached a game of football, but I have played the game on every level, including seven Pro Bowl appearances. On the way to becoming a member of the National Football League Hall of Fame, since my playing days, I've noticed continual improvements in the equipment used by players on the fields. Helmets used in my days were little more than a thin plastic layer with a small donut shaped piece of foam rubber at the top.

And I've brought these two helmets, Pro Bowl helmets, as an example for you to examine today for yourself. Today's helmet is much more protecting for the players enduring the games and competition. I recognize that in today's game, the athletes are bigger, stronger, faster, and in some cases more intelligent. As a result of the hits, they are harder and the impact from each hit is greater. With much research into the way to protect the players, we can continue to enjoy this game for years to come.

Thank you again for your hard work on this issue and inviting me to be here at this hearing. I'll look forward to answering any questions that you may have. Thank you very much.

[The prepared statement of Mr. Barney follows:]

Prepared Statement of Lemuel Barney

TESTIMONY OF LEMUEL BARNEY

BEFORE THE COMMITTEE ON THE JUDICIARY

UNITED STATES HOUSE OF REPRESENTATIVES

JANUARY 4, 2010

Good Afternoon Chairman Conyers and other members of the House Judiciary Committee, I am Lem Barney. Prior to becoming a minister, I played professional football for the Detroit Lions for 11 seasons and was inducted into the Professional Football Hall of Fame in 1992. I began playing football in 1959 Sturgis Junior High in San Bernardino, California. After a playing high school football in Gulf Port, Mississippi, I attended Jackson State University, where I was a three time all-SWAC player. I thank you for inviting me to testify at this hearing. I also want to thank the Committee for bringing awareness to the important issue of brain injuries in professional football. When I played in the 60's and 70's, we did not have the same level of awareness that we do now, and we should not repeat the mistakes of the past.

I played football for a total of 20 years and concussions have always been part of the game. I have had several concussions. The first concussion that I remember was the result of a knee from Rufus Mays to the ear hole in my helmet on a play in a game. I was out on the field for twenty-one minutes before moving to the side line and later returning to play. The next concussion that I recall was a result of me becoming privy to the high knee action that made Gayle Sayers the running back that we all know today. And the final concussion that I recollect was from Robert Newhouse, known for his powerful running style.

In each incident I returned to play immediately. Sure, there was an examination done by the trainer or team doctor on the side line. There were general questions asked of players that experienced concussions. Questions like "how many fingers am I holding up?" and "what day of the week is it?" but in reality, the ultimate decision to return to the game rested on the desire of the player, and sometimes the coach.

Hindsight tells us that we should not have returned to play based on those factors alone. New research into the effects of these injuries tells us that returning to play may not have been in our best interest and more than likely made us more susceptible to further injury. But back then, as I am sure the case for some players now, guys just wanted to play. I have witnessed guys return to the game and seen firsthand how they reacted to their injuries. Players would exhibit signs of wooziness and imbalance but still in some instances be allowed to retake the field. As I said before, hindsight tells us that those players would have probably been better off not returning, thankfully that decision is moving closer to the hands of an independent third party.

The Committee and the NFLPA should be applauded for raising the public's awareness of this issue. I particularly want to note the NFLPA's new Player Concussion Committee, which will ensure that future

generations of players are provided with the knowledge to make the best possible decisions. I am delighted and encouraged to see players taking the initiative and exerting control over their personal welfare. I would also like to commend the NFL on the League's new policies to restrict the return of players who have experienced concussions and other brain injuries.

Football is a great sport and one of my favorite passions, but no sport should endanger the lives of its participants. This holds true for all levels of football, from Pee-Wees to professionals. I have never coached the game of football but I have played the game on every level including several pro bowl appearances on the way to becoming a member of the NFL Hall of Fame. Since my playing days I have noticed continual improvements in the equipment used by players on the field. Helmets used in my time were little more than a thin plastic layer with a small donut shaped piece of foam rubber in the top. (I have brought an example here for you to see for yourself.) Today's helmet is much better at protecting the player during the game and in competition.

I recognize that in today's game the athletes are bigger and stronger and faster. As a result the hits are harder and the impact from each hit is much greater. With more research into ways to protect the players, we can continue to enjoy this game for years to come. Thank you again for your hard work on this issue and inviting me to this hearing. I look forward to answering any questions that you may have.

Mr. CONYERS. Thank you very much, Lem Barney.

Our next witness is Dr. Bennet Omalu who discovered and named chronic traumatic encephalopathy in American football, and not only among football players but wrestlers, as well. His first case of CTE in a football player was Mike Webster, the Pittsburgh Steelers Hall of Famer who died in 2002. His first case of CTE in

a wrestler was Chris Benoit, a World Wrestling Entertainment Champion who died in the year 2007.

Dr. Omalu has also identified CTE in an 18-year-old high school player who died in 2006 10 days after following concussions sustained while he was playing football. He's examined the largest number of brains of deceased professional and amateur athletes with CTE in the United States. His book Play Hard, Die Young, Football Dementia, Depression and Death, he's published extensively in the medical literature field. He has four board certifications, a Master's in Public Health and Epidemiology, a Master's in Business Administration, a visiting professor at the Blanchette Rockefeller Neurosciences Institute, a Co-Director of Brain Injury Research Institute, an Associate Clinical Professor of Pathology at the University of California - Davis, and Chief Medical Examiner with San Joaquin Valley County in California.

We're delighted to have you, sir, with us today, and we welcome you for your testimony.

TESTIMONY OF BENNET I. OMALU, M.D., CO-DIRECTOR, BRAIN INJURY RESEARCH INSTITUTE, WEST VIRGINIA UNIVERSITY

Dr. OMALU. Thank you, Chairman Conyers, and good afternoon, everybody. Good afternoon, Chairman Conyers, Congresswoman Sánchez, and Congressman Cohen.

I discovered the first eight cases of footballer's dementia in football players between 2002 and 2008. My first case was Pittsburgh Steelers Hall of Famer, Mike Webster, whose life after retirement was marred by progressive symptoms of permanent brain damage. Surprisingly, his brain at autopsy appeared normal by naked-eye examination.

I performed extensive tissue analysis which revealed a unique type of dementia. As you can see from the following slides, a microscopic image on the right is Mike Webster's brain. You can see the brown blotches which indicate brain damage. That was his brain appeared normal, even on CT scan and on MRI.

The image on the left is that of a normal brain. This instigated my definition of a new disease in football players which I called chronic traumatic encephalopathy, CTE for short. Since Mike Webster, my colleague and I, Dr. Julian Bailes, have examined over 20 brains of amateur and professional contact sports athletes at the Brain Injury Research Institute, West Virginia University School of Medicine. We have identified CTE in many football players, including an 18-year-old high school football player.

We have also identified CTE in two WWE wrestlers. I have identified CTE changes in the brain of a Vietnam War veteran diagnosed with lingering posttraumatic stress disorder which, hopefully, should be published soon in the Stars and Stripes. I have examined thousands of brains of sufferers of all types of brain injuries, including brains of high school students, football players who died from brain injury sustained while playing football.

The current focus has primarily been on concussions and has remained on concussions, while we are not recognizing subconcussions. A concussion may present one end of the spectrum of mild traumatic brain injury; however, subconcussions or blows to the head which may not manifest with incapacitating symptoms are

equally as important as concussions. For every one documented concussion, there may be tens to hundreds of subconcussions. Thousands of subconcussions without any documented concussion can equally result in permanent brain damage and dementia in football players and other individuals at risk for brain injury such as members of the Armed Forces.

We must also consider the neuropathology of traumatic brain injury while developing management protocols for concussions. Concussions result in the accumulation of certain types of proteins in the brain. For example, amyloid precursor protein, APP for short. APP begins to accumulate noticeably in brain cells and their fibers about one to 3 hours following a concussion. APP disappears from the brain after about 3 months following a a concussion.

While a concussed player may be symptom free, several weeks after sustaining a concussion, APP accumulation in the brain will tell us that a concussed player's brain cells may not have recovered after several weeks. Would 1 week, 2 weeks, or even several weeks be sufficient postinjury intervals for the concussed player to return to play and prevent permanent brain damage?

The human brain becomes fully developed at the age of 18, injury to the developing brain of a child is more likely to result in more serious adverse outcomes than a developed adult brain. The brain cells of children who play football are more vulnerable to subconcussions and concussions. A child who plays football can be precluded from obtaining the full capacity of his cognitive and intellectual functioning as an adult. How can we translate and apply this piece of information to the administration and management of football in children?

Rules changes may mitigate the prevalence of subconcussions and concussions. Unfortunately, it seems less likely that impacts to the head may be completely avoided in the game of football. The ultimate focus, therefore, should be on the development of biomarkers and the identification of drugs which will prevent and cure CTE and other sequelae of subconcussions and concussions.

We have identified proteins which accumulate in the brains of CTE sufferers. We also have noted proteins, which accumulate in the brain following subconcussions and concussions. There are existing drugs which we know can prevent the accumulations of these abnormal proteins. If we can prevent the formation and accumulation of these abnormal proteins, there is a high scientific probability that we can cure CTE and other sequelae of subconcussions and concussions.

We should focus on developing a battery of biomarkers in clinical pathology for subconcussions, concussions, and CTE. Decades ago, we did not have biomarkers which were specific for heart attacks in clinical pathology. Today, fortunately, we have a specific diagnostic marker for heart attacks called Troponin-I. There is no reason why a similar model cannot be developed for the diagnosis and treatment of subconcussions, concussions, and CTE in football players.

Thank you for allowing me to speak with you, and I'm very happy and excited to be here today.

[The prepared statement of Dr. Omalu follows:]

PREPARED STATEMENT OF BENNET I. OMALU

BRAIN INJURY
RESEARCH INSTITUTE

ONE HUNDRED ELEVENTH CONGRESS

CONGRESS OF THE UNITED STATES

HOUSE OF REPRESENTATIVES

COMMITTEE ON THE JUDICIARY

FIELD HEARING

LEGAL ISSUES RELATING TO FOOTBALL HEAD INJURIES, PART II

Monday, January 4th, 2010

WRITTEN STATEMENT

BY

BENNET I OMALU, MD, MBA, MPH
Forensic Pothologist/Neuropathologist/Anatomic Pathologist/Clinical Pathologist/Epidemiologist
Co-Director, Brain Injury Research Institute, West Virginia University, Morgantown, West Virginia
Chief Medical Examiner, San Joaquin County, California
Visiting Professor, Blanchette Rockefeller Neurosciences Institute, Morgantown, West Virginia
Associate Clinical Professor of Pathology, University of California, Davis

1132 Junewood Court

Lodi, CA 95242

bennetomalu@comcast.net

MIKE WEBSTER, THE FATHER OF CHRONIC TRAUMATIC ENCEPHALOPAHTY [CTE]

Good afternoon Chairman Conyers, Ranking Member Smith, and members of the Committee.

I discovered the first case of footballer's dementia in Pittsburgh Steelers Hall of Famer Mike Webster. I performed an autopsy on Mike Webster in 2002 when he died suddenly at the age of 50. Mike Webster's life after retirement from football was marred by progressive symptoms of dementia, major depression, mood disorders, drug abuse and violent/criminal tendencies.

Surprisingly his brain at autopsy appeared normal by naked eye examination. In spite of his brain appearing normal, I performed extensive tissue analysis of his brain using sophisticated tissue technology, which revealed a unique type of dementia. This instigated my definition of a new disease, which I called Chronic Traumatic Encephalopathy [CTE].

Prior to Mike Webster, there was no defined disease entity in football players known as CTE. The lesson Mike Webster taught us was that brains of contact sports athletes may appear normal by naked eye examination, by routine radiological examination using computerized axial tomography [CT] scans or by routine magnetic resonance imaging [MRI]. At this juncture, CTE can only be diagnosed definitively by tissue analysis at the cellular level using specialized proteomics technology. Frequently sufferers of CTE are told by their doctors that they do not have any substantive clinical evidence of dementia to support a confirmatory diagnosis of footballer's dementia.

THE BRAIN INJURY RESEARCH INSTITUTE [BIRI] AND CTE

Since Mike Webster, my colleague and I, Dr. Julian Bailes, Chairman of the Department of Neurosurgery at West Virginia University School of Medicine, have examined over twenty brains of amateur and professional contact sports athletes. We have done so as part of the group we co-founded: the Brain Injury Research Institute, based at the West Virginia University School of Medicine.

Our cohort at this time, in part includes three high school football players, eight professional football players, four professional wrestlers, one professional mixed martial arts fighter and two professional boxers. We have identified incipient CTE in an 18 year old high school football player. We have also identified CTE in two WWE wrestlers. We have examined the brains of a variety of subjects of repetitive brain injuries ranging in age from 2 years old to 89 years old. I have also identified CTE changes in the brain of a Vietnam War veteran diagnosed with lingering post traumatic stress disorder.

At the Brain Injury Research Institute, we have identified subtypes of CTE, which we expect will be published soon in a top scientific journal. By the end of 2010, we expect

to have published eight papers on CTE, presenting to the scientific community and the general public what we have deciphered thus far on the disease, how doctors can diagnose it and how families can recognize the symptoms as they emerge.

Perhaps more importantly, I om very happy to announce that my colleagues and I at the Brain Injury Research Institute are currently engaged in research on treatments for this condition. These include moving forward on studies of possible pharmacologic means for preventing and even curing CTE. We are also researching on a genotypic distribution of CTE sufferers to possibly identify a genetic proclivity for CTE.

Dr. Julian Bailes, a preeminent neurosurgeon and director of BIRI, is leading the expansion of our research efforts in evaluating, diagnosing, monitoring and advising living amateur and professional football players, who may be suffering from CTE, with the objective of developing clinical interventions for CTE. We need the support of the federal government, state governments, other governmental agencies, foundations and individuals to continue advancing this field of study, since the sequelae of sub-concussions and concussions are emerging as major public health threats of the 21st century.

CTE, SUB-CONCUSSIONS AND CONCUSSIONS

The concept of permanent brain damage and dementia following repeoted blows to the head is a very well established and generally accepted principle in medicine. The first cases of dementia and brain damage in contact sports athletes were first described in boxers and the disease was named dementia pugilistica. Dr. Harrison Martland, a forensic pathologist, like myself, and the chief medical examiner of Essex County, Newark, New Jersey, described dementia pugilistica in 1928. However, it was not until we examined the brain of Mike Webster in 2002 did we identify the tissue evidence of a similar disease in football players, which we have named CTE.

When I brought these findings to the attention of the NFL and the WWE, their responses were not supportive, to say the least; which is why I applaud the work of Chairman Conyers and this Committee. It is clear to me that without your intervention, there would have been no meaningful action to address the safety of athletes.

Because as we all know, the current issue at stake is not the debate whether CTE exists, but what we can all do together to help protect athletes and eventually develop a cure for CTE. I would laud the NFL for their recent pronouncements on CTE, which I must say were very much more encouraging than their pronouncements in 2002, 2005 and 2006, when we identified CTE in Mike Webster, Terry Long and Andre Waters. However, we must not make the mistakes of the past. Our approach and management of the sequelae of repetitive brain trauma in sports must be based on sound scientific principles interpreted by knowledgeable doctors who are adequately credentialed in sports medicine and neurologicol medicine.

The current focus has primarily been on concussions, while we are not yet paying enough attention to sub-concussions. There is a broad spectrum of acceleration-deceleration injuries to the head; unfortunately a concussion may represent one end of the spectrum. Sub-concussions or blows to the head, which may not manifest with immediately incapacitating symptoms and signs are equally as important as concussions in the patho-etiology of CTE. For every one documented concussion, there may be tens to hundreds of sub-concussions. Hundreds to thousands of sub-concussions can equally result in permanent damage to the brain cells on the cellular level in at least a proportion of the population. We know that only about 20% of amateur and professional boxers will manifest the most severe forms of CTE/ dementia pugilistica with multi-domain and global impairment of brain functioning. A much larger proportion of individuals, we believe, will manifest less severe forms of CTE with single to several domain impairment of brain functioning like memory problems, mood disorders and major depression.

Concussions and Return to Play Guidelines

We must also consider the neuropathology of traumatic brain injury on the cellular and sub-cellular levels while developing models for the management of concussions in sports. Concussions to the brain cause cellular injuries to the cell membrane and cytoskeleton. These injuries result in the upregulation of specific genes, and the accumulation of certain types of proteins and peptides in the brain, for example Amyloid Precursor Protein [APP]. APP begins to accumulate noticeably in brain cells and nerve fibers about one to three hours following a concussion. APP disappears about three months following a concussion.

In considering this specific piece of neuroscientific information, one may question the basis for keeping a concussed player out of play for anytime shorter than three months. While a concussed player may be symptom free on the gross functional level after several weeks of sustaining a concussion, APP accumulation in the brain tells us that the player's brain may not have recovered after several weeks. The big question, we should then ask ourselves, based on the science, is whether one week, two weeks, or even several weeks are sufficient post-injury intervals for a player to return to play?

Concussions and the Brains of Children

When we are born, our brain weighs about 350 grams; at about one to two years of age, the brain attains about 75% of the adult size. The brain reaches 90% of its adult size at the fifth year and 95% by ten years old. The brain attains adult size by the seventeenth or eighteenth year largely due to continued myelination of nerve fibers. Before the age of eighteen, the human brain remains a developing brain.

Expectedly, injury to the developing brain of a child is more likely to result in more deleterious and more serious adverse outcomes than the developed adult brain. This means that the brains of children who play football are more vulnerable to the repeated impacts, sub-concussions and concussions intrinsic to the game of football. This means that a child who plays football may be precluded from attaining the full capacity of his cognitive and intellectual functioning as an adult. How can we translate and apply this piece of neuroscientific information to the administration and management of football in children?

Understanding the Pathology of CTE, Concussions, and Sub-Concussions

A forensic pathologist described dementia pugilistica in boxers. Another forensic pathologist described CTE in football players and wrestlers. The works of these two forensic pathologists underscore the vital role forensic pathologists and medical examiners play in further elucidating CTE and the effects of concussions and sub-concussions. One of the greatest problems we have encountered at BIRI is the reluctance of forensic pathologists to save whole brains for comprehensive examination with the misunderstanding that tissue analysis for CTE diagnosis is primary research and not disease diagnosis.

Tissue analysis for diagnosis of CTE in the brain of a deceased athlete is similar to tissue analysis for diagnosis of Alzheimer's Disease in the brain of any deceased individual. Diagnosis of Alzheimer's Disease is not primary research and does not require the consent of any next-of-kin, and similarly diagnosis of CTE should not be classified as primary reseorch and should not require the consent of ony next-of-kin. The judgment and decision whether to perform tissue analysis for CTE diagnosis should be that of the forensic pathologist performing an autopsy as part of differential diagnosis and determination of cause and manner of death.

Forensic pathologists should be encouraged, possibly through legislation, to become more proactive in routinely identifying and diagnosing CTE in all autopsied deceased contact sports athletes. This practice can only generate more independent and objective data, which will enable multidisciplinary development of preventive and curative interventions for CTE and other types of sports related brain injury sequelae.

BIRI, NFL, Prevention and Possible Cure for CTE

Clinical bio-markers

Currently, there are no diagnostic clinical bio-markers for CTE, concussions or sub-concussions in the living patient. We should focus on developing a battery of objective quantitative bio-makers in the blood for sub-concussions, concussions and CTE in clinical pathology. Decodes ogo we did not have specific bio-makers for heart attacks; today fortunately, we have a bio-maker called Troponin-I for heart attacks. If your

Troponin-I blood level was elevated beyond an established threshold it would be clinically diagnostic of heart muscle necrosis [heart attack]. Similarly if your prostate specific antigen [PSA] blood level was elevated beyond set thresholds, it would also be diagnostic of hypertrophy [enlargement] of the prostate and/or prostate cancer. These are all high through-put tests, which can be performed within minutes in very efficient analytical systems.

There is no reason why similar models cannot be developed for sub-concussions, concussions and CTE for the diagnosis, monitoring and management of traumatic brain injury in football and in all types of contact sports. Bio-makers would be superior, more efficient, more objective, more reproducible and more quantitative diagnostic tools than neuropsychiatric testing. While neuropsychiatric testing is useful, we should not stop at neuropsychiatric testing. We should work collaboratively and relentlessly in applying the science of proteomics to developing diagnostic bio-makers and diagnostic algorithms, which are specific for CTE and the sequelae of concussions and sub-concussions in sports.

Proteomics, peptides, proteins and possible cure for CTE, concussions and sub-concussions

Impacts to the head and body are intrinsic to the play of football and other types of high-impact contact sports. Rules changes may mitigate the prevalence of sub-concussions and concussions; unfortunately, it seems less likely that impacts to the head may be completely avoided in the game of football. The ultimate focus therefore should be on developing prophylactic and curative interventions, including pharmacologic interventions, for both the acute, sub-acute, delayed, chronic and persistent sequelae of sub-concussions and concussions.

The propositional value of our work on CTE is that we have identified the proteins and peptides, which accumulate in the brain of CTE sufferers. We also know the proteins and peptides, which are involved in the pathogenesis of concussions and sub-concussions both in the acute and sub-acute post-injury periods. There are existing drugs, which we know can prevent the accumulations of these abnormal peptides and proteins, and the abnormal chemical reactions, which bring about these accumulations. If we can prevent the formation and accumulation of these abnormal peptides and proteins, there is a high scientific probability that we can cure CTE, acute and chronic sequelae of concussions and sub-concussions. We can develop laboratory based analytical systems and clinical trials to test these drugs for their ability to successfully interrupt the pathological cascades of CTE and the sequelae of concussions and sub-concussions.

Understanding traumatic brain injuries is a complex endeavor, which requires multi-faceted and multi-disciplinary efforts that cannot be provided by only a committee of doctors and other professionals. The NFL and other organizers of contact sports, at all levels, should finance studies and research by different, unrelated independent research groups and individuals across the United States including residents, fellows,

doctoral and post-doctoral students. No single individuol or group con provide all the innovative ideas, novel methodologies, original thought and intuition, which would be needed. Such research sponsorships should not be based on any affiliations, associations, preferences or pre-conditions. They must remain completely unbiased and transparent.

Elucidating and deciphering CTE and the sequelae of sub-concussions and concussions can only enhance the game of football and other high impact contact sports at all levels of play. It can only enhance the health, safety and quality of life of all players, their families and the general population. It can only reduce the unimaginable direct, indirect, tangible and intangible economic costs to these players and their families at all levels, the NFL, other organizers of contact sports and the society at large.

Thank you again for allowing me to speak with you and I will be pleased to answer any questions.

Mr. CONYERS. Thank you very much, Dr. Omalu.

We now welcome Dr. Ira Casson, a neurologist at the Long Island Jewish Medical Center, Former Co-Chairman of the National Football Leagues' Mild Traumatic Brain Injury Committee. He's a graduate of the New York University Medical School, and finished his residency there at the same place in 1979. We're delighted that you can be with us, sir.

TESTIMONY OF IRA R. CASSON, M.D., FORMER CO-CHAIRMAN, NFL MILD TRAUMATIC BRAIN INJURY COMMITTEE

Dr. CASSON. Thank you. I want to thank the Committee for inviting me to participate in this hearing. I will directly address the issue in question, namely, whether or not a career in professional football causes long-term chronic brain damage.

The media has consistently misrepresented my position. My position is that there is not enough valid, reliable, or objective scientific evidence at present to determine whether or not repeat head impacts in professional football result in long-term brain damage. Many have misunderstood my caution in jumping to conclusions without convincing scientific evidence as a denial of a link between head impact and long-term consequence.

Since I understand the link in boxing, I've been acutely sensitive to look into connections in football. I believe that there is tau pathology in the brains of some retired professional football players and that a number of retired NFL players have neurological and behavioral, psychological symptoms.

As a physician, I am very concerned about the possible long-term implications of these findings for the health and safety of NFL players. I sympathize with the players and the families who are affected. As physicians and scientists, it behoves us to critically evaluate the evidence before reaching definitive conclusions. We must always remember the fundamental principle of evidence that the presence of an association does not establish causation.

When tau deposition in the brains of retired NFL players was reported, the NFL MTBI committee examined the evidence in great deal. We reviewed the relevant scientific literature. I took the initiative on behalf of the MTBI committee to consult with nationally known experts on tau pathology. Based upon these rigorous scientific analyses and consultations, I believe that there are a number of significant limitations and inconsistencies in the reports of tau deposition. I have detailed these in my written statement.

For example, tau pathology is not exclusive to head trauma. Tau deposition is the predominant pathology in a number of other neurologic diseases that have never been linked to athletics or head trauma. Some of these diseases have genetic causes, some have environmental toxic causes, and others are still of unknown cause. The clinical picture of these other tau diseases is also completely different than that that has been reported in the cases by Dr. McKee and Dr. Omalu.

Since tau pathology has been reported in men who played college football but never played professional football and even an 18-year-old high school athlete, we must consider the possibility that some event or events, possibly head trauma, occurring in childhood or adolescence is an important causative factor in its development. It

is also very hard to imagine how tau in the lower regions of the spinal cord could possibly be related to head impacts.

I have also analyzed the three survey studies that purportedly show a connection between professional football and late onset dementia and depression. These types of survey studies suffer from many inherent methodological limitations that I have detailed in my written statement. I was the lead author of a landmark paper on brain damage in modern boxers that was published in JAMA in 1984. Despite harsh criticism from the boxing community, I followed the evidence, and I published the findings. Despite current harsh criticism from the media and others, I will continue to follow the evidence. My allegiance is to scientific truth.

Some have suggested that scientific evidence regarding the question at hand is conclusive and that there's no need for further research. I strongly disagree with that position. In the present state, we have a tau pathology condition that can only be diagnosed after death. When treatments aimed at curbing tau deposition become available, how will physicians know which, if any, football players might benefit from these treatments while they are alive?

We need further scientific research to discover in vivo means of diagnosing tau buildup. In the present state, many assume that all football players with symptoms of depression or dementia have these as a result of tau pathology. This ignores all of the other conditions and diseases that are associated with dementia and/or depression in the general population. Such thinking does retired players a disservice by not considering the possibility that their symptoms may be related to treatable or otherwise manageable conditions rather than a condition which will inexorably lead to deterioration.

At present, many assume that head injury is the only possible cause of this tau deposition. If we ignore the possibilities that genetic, environmental, or toxic factors may play a role in the development of tau deposition, we may overlook strategies that ultimately can prevent its occurrence. I believe that studies like the NFL Retired Players Study are the most effective way to investigate the possibility that professional football causes chronic brain dysfunction.

The NFL Retired Players Study has been derailed by unwarranted and inaccurate media and political attacks. I hope that this important study will ultimately withstand this hostile environment and continue on to completion. If that does not occur, the wealth of clinical information that has already been collected from the more than 40 subjects who've been thoroughly evaluated should be reported in the medical literature.

My primary goal has always been to advance the scientific and medical knowledge of concussions, thereby improving the health and safety of NFL players. Toward that end, I made a number of recommendations for further scientific research in my written statement. Thank you, and I'll be glad to answer any questions.

[The prepared statement of Dr. Casson follows:]

PREPARED STATEMENT OF IRA R. CASSON

Ira. R. Casson, M.D. – Written Statement

Ira R. Casson MD - Written Statement - January 4, 2010

I want to thank the chairman and the other members of the committee for inviting me to participate in this hearing. I will directly address the issue in question, namely, whether or not a career in professional football causes long term chronic brain damage. The media has consistently misrepresented my position by reporting that I deny the possibility that professional football may be the cause of long term brain damage. That is not my position. My position is that there is not enough valid, reliable or objective scientific evidence at present to determine whether or not repeat head impacts in professional football result in long term brain damage. I believe that there is tau pathology in the brains of some retired professional football players and that a number of retired NFL players have legitimate neurological and behavioral/psychological symptoms. As a physician I am very concerned about the possible long term implications of these findings regarding the health and safety of NFL players. I sympathize with the players and the families who are affected.

As physicians and scientists, it behooves us to critically evaluate the evidence before reaching definitive conclusions. My education, training and clinical experience have provided me with the tools necessary to accomplish this task. In the process of researching and writing my honor's thesis at Cornell, I learned how to critically analyze scientific manuscripts and how to view science in its historical and social contexts. I studied how political pressures can subvert the scientific process. During my medical school years at NYU, I learned how to transfer information gleaned from scientific research to the clinical evaluation and treatment of patients. As resident and chief resident in neurology at NYU-Bellevue, I was fortunate to have had the unique experience for a neurologist of having primary clinical responsibility for the diagnosis and treatment of many hundreds of patients with head injuries of all severities. After completing my residency, I pursued my clinical interest in head injuries by studying boxers. Over the next few years, I exhaustively studied the neurological literature regarding brain injuries in boxers and performed numerous neurological examinations of boxers. With the assistance of many colleagues, I performed clinical neurological research studies on active and retired boxers. Our study on retired boxers that was published in JAMA was the first to report the results

of clinical neurological examinations, neuropsychological testing, EEGs and CAT scans of the brain in retired boxers. The evidence collected in that study demonstrated that modern era retired boxers had signs of chronic brain damage. Many in the boxing community expressed their displeasure with the findings and criticized the paper. This did not deter me from publication. Then, as now, my allegiance was to scientific truth and I followed the scientific evidence.

Since 1982, I have been in solo private practice of general neurology in Forest Hills, New York. In addition to treating a wide variety of general neurology patients in the office and hospital settings, I have treated numerous head injured patients, including athletes of all ages and skill levels as well as non athletes.

In 1994 I was invited by then NFL Commissioner Tagliabue to become an original member of a newly formed scientific NFL committee on mild traumatic brain injury. The goals of that committee were congruent with my goals: to advance the medical/scientific knowledge of concussions and thereby improve the health and safety of NFL players. I joined the committee in an advisory/consultant capacity. I never was an employee of the NFL and I have always maintained my fulltime private practice of neurology. During my fifteen years as a committee member, including three years as co-chairman, we did research on the biomechanics of NFL concussion, the clinical and epidemiologic features of NFL concussion, neuropsychological testing in NFL players and scientific testing of protective headgear. In collaboration with Dr. Albert King of Wayne State University, we studied finite element modeling of NFL concussions. In collaboration with researchers in Sweden, we developed an animal model of NFL concussion.

All of the committee's research and scientific endeavors were conducted in a completely open and transparent fashion. We published our studies in the peer-reviewed medical literature. We participated in vigorous scientific debates. We invited outside experts from various scientific/medical disciplines, from academia as well as private industry, to attend and speak at our meetings. We have encouraged scientists to study and present their results to the scientific community. The committee has sponsored educational symposia for NFL medical and training personnel to update them on the latest scientific/ medical advances regarding concussion. We invited outside experts to speak at these events. We have shared our

findings with Department of Defense medical experts. Although there is always more scientific work to be done, the work of our committee definitely advanced the scientific/medical knowledge of concussions and thereby improved the health and safety of NFL players.

I have been concerned about the possibility of long term effects on the brain related to football for close to thirty years. My studies and investigations on the chronic effects of boxing on the brain have provoked questions and concern regarding the possibility of similar effects related to other contact sports including football. One of the reasons that I was asked to be on the NFL MTBI committee was because of my knowledge of and experience treating boxers with chronic traumatic encephalopathy (CTE).

In 2003, members of our committee began to formulate a plan to scientifically investigate the possibility that there were long term effects on the brain due to a career in professional football. We planned a clinical research study modeled after the study that I had directed on retired boxers in the 1980s. We wanted to undertake a study that would be more exhaustive and include a control group. In order to assure the highest possible scientific quality, we consulted with leading experts from various medical/scientific fields at leading research academic centers around the country. We consulted with neuroradiologic MRI experts at USC, the University of Wisconsin, Mt. Sinai Hospital Medical Center in New York and Dr. Mark Haacke of Wayne State University. We consulted with neuropsychology experts including the president of the National Academy of Neuropsychology and experts at Columbia University in New York and the University of Texas-Southwestern. We consulted experts on APOE genotyping at Duke University. Committee member Dr. Joel Morgenlander, professor of neurology at Duke University, and I formulated a detailed plan for performing comprehensive clinical neurological evaluations. The result of these efforts was a comprehensive research study employing clinical neurological examinations, comprehensive neuropsychological testing, state of the art MRI imaging of the brain and APOE genotyping to evaluate a large group of retired NFL players and control subjects. The control group consists of age similar men who played college football and then attended NFL training camp but played less than one full regular season in the NFL. The MRI brain protocols and analyses for the study are under the direct supervision of Dr. Mark Haacke of Wayne State University. The statistical

analyses used in the development of this study were performed at Wayne State University. The NFL is funding this study.

Despite what inaccurate and distorted media reports have suggested, I have never prejudged the results of this or any other scientific study. I have no bias regarding the outcome of this study. All the examinations and testing for the study (including the neurological examinations) are performed in a completely blinded fashion (the status of the subject as a retired player or as a control is not known to the examiner). All data analyses are performed in a blinded fashion by experts who played no role in the data collection. Since all of the testing is standardized, the data from the retired players can be compared to both the control group and the general population.

The MTBI committee and I have closely followed the medical literature and the reports of studies suggesting a link between professional football and long term brain damage. Based upon three survey type studies in retired NFL players and a small number of case reports of neuro- pathological abnormalities in the brains of retired NFL players, some have suggested that chronic brain damage in football players is an epidemic that constitutes a national health crisis. It is my opinion that there is as yet not enough scientific evidence to support such statements. Clearly there is abnormal tau pathology in the brains of a small number of deceased former NFL players. Some living retired NFL players have experienced neurological/ behavioral/psychological problems that may be related to this type of pathology or perhaps to other factors. This is a matter of great concern to me. However, as scientists and physicians it behooves us to carefully analyze the evidence before reaching definitive conclusions.

Three survey studies have been cited as proof that a career in the National Football League increases the risk of dementia and/or depression later in life. All were mail-in surveys or telephone surveys. There are a number of methodological limitations inherent to these types of studies. The data collected is highly dependent on the subjects' motivation and memory. The researchers can never be sure that the percentage of subjects who respond are truly representative of the entire study population. These types of self report questionnaires are limited by response bias (the subjects respond to all the questions in a pattern manner) and social desirability response set bias (subjects' responses are

based on what they think they should answer rather than what they may actually think).

These and other problems are readily apparent upon scientific analysis of the two papers from the University of North Carolina regarding the risks of depression and late life cognitive impairments in retired NFL players. It must be pointed out that both of these papers are based upon the same collection of data from the same self report questionnaires mailed to the same subjects and their spouses. In other words, the two papers are the result of one study, not two separate independent studies. The first questionnaire was mailed to 3,683 subjects, of whom 1131 (30.7%) did not respond. A follow up memory questionnaire was then sent to 1,754 retirees over age 50 who had responded to the initial questionnaire; 996 (66.8%) did not respond. There is no way to know if the large numbers of subjects who did not respond would have answered the questions posed in the same way as though who did respond. If many of the non-responding subjects did not answer because they were healthy and had no medical/neurologic or psychiatric complaints, this clearly would have biased the study results toward reporting a higher incidence of cognitive or depression symptoms than was truly present in the entire study population. These studies relied solely upon the memories of the subjects to collect data on concussion history 20 to 50 years in the past. Yet, the authors then reported that many of these same subjects had cognitive/memory problems. This raises serious doubts about the reliability of the data. The absence of a valid control group makes any comparisons to the general population difficult to interpret. The authors attempted to make a comparison to the United States population incidence of dementia but this comparison is invalid because the general population data were not collected from self report and spouse report questionnaires as was done in this study.

In the paper regarding depression, the authors reported that 11.1% of the entire group had been diagnosed with clinical depression, which they then state is "generally consistent with" the incidence in the general U.S. population. This suggests that retired NFL players <u>do not</u> have an increased risk of depression. The authors then stratified the data and reported that subjects with a history of no concussions had a 6.5% incidence of depression, those with a history of one or two concussions had a 9.74% incidence of depression and those with 3 or more concussions had a 20.17% incidence of depression. Does this mean that professional football players who sustained two or fewer concussions during their careers

are somehow protected from (partially immune) to developing depression later in life compared to other American men who never played professional football? Or are these results evidence of a phenomenon known to clinicians and social researchers as "selective memory"? This occurs when subjects who suffer from an illness (in this case depression) unconsciously seek out a cause for that illness and are thus more likely to "remember" prior concussions. These studies also suffer from the absence of any objective verification of the subjects reports. There are no reports of any physical examination findings or diagnostic study findings on any of the subjects.

The third self report "study" recently cited as indicating that retired NFL players have an increased incidence of cognitive/ memory impairments was done at the University of Michigan by Dr. David Weir and funded by an arm of the National Football League. This study has the same limitations and problems as the other two studies, as Dr. Weir himself has clearly noted. One need only review Dr. Weir's testimony to this congressional committee in October 2009 and read his written statement to the NFL MTBI committee in November 2009 to realize that this study did not find evidence that retired NFL players have an increased incidence of cognitive/memory problems. Dr. Weir testified to Congress:" The study was not designed to diagnose or assess dementia. The study did not conclude that football causes dementia." Dr. Weir wrote to the NFL MTBI committee: "The 19:1 ratio reported in The New York Times is just unsupportable given the evidence that the source for the "one" is much too low where we can compare with true rates. I told that to (New York Times reporter) Schwarz but he chose to ignore it. Again, nothing in this study says there is not a connection between football on any level and subsequent cognitive problems and nothing says there is. The study is mute on this issue but unfortunately the press is not".

I have also analyzed the neuropathology reports from doctors Omalu and Mckee regarding abnormal tau deposition in the brains of retired NFL players. When Dr. Omalu published his first case, I along with other NFL MTBI committee members reviewed the report carefully and found a number of scientific issues with it. We engaged Dr. Omalu and his co-authors in an appropriate scientific debate by writing a letter to the editor of the journal in which the report had been published. Our objections were based on two major areas: 1. Dr. Omalu had claimed that the neuro- pathological findings in his case were

consistent with those reported in CTE of boxers by Dr. Corsellis in a classic 1972 paper. Based upon my familiarity and knowledge of Dr. Corsellis' paper and the other scientific literature of CTE in boxers, we pointed out the multiple reasons why the Omalu reported findings were not consistent with the Corsellis report, and (2) we pointed out the numerous limitations in the minimal clinical information reported on the retired player in question and that there were no reports of any objective physician evaluations or diagnostic studies regarding the subject. In our letter we indicated there were major weaknesses inherent in reporting only posthumously obtained historical information from the deceased's family. When Dr. Omalu subsequently published a case report on the neuropathology of a second retired player, we again carefully evaluated the report and expressed our scientific opinions regarding the weaknesses of the paper in a letter to the editor of the journal. We pointed out that the reported neuropathology in the second case was different in many ways from that in the first case. We again noted the dearth of contemporaneously obtained objective clinical information about the subject and the sole reliance on posthumously obtained information from the deceased's family. We also pointed out a number of inconsistencies between the limited clinical information that was presented and the summary and conclusions reached by Dr. Omalu.

In June, 2007, at our invitation, Dr. Julian Bailes presented some of Dr. Omalu findings at an NFL conference on head injuries for all NFL team medical personnel. At the conference Dr. Bailes indicated that he and Dr. Omalu believed that these neuropathological findings of abnormal tau protein deposition in the brain had caused depression and suicidality in the two retired players whose brains were the subject of the reports in the medical literature and in a few other cases which had not been reported in the medical literature. At the meeting, I disagreed with Dr. Bailes' conclusions and he and I engaged in a scientific debate over this issue. At the end of the meeting, we agreed that more studies and evaluations were needed.

Over the next few months, the MTBI committee and I sought out expert opinions from the most distinguished tau researchers from renowned academic medical centers around the country. These experts indicated to us that no scientific conclusions could be reached from the two case reports and agreed that further studies were necessary. One of these experts, Dr. Peter Davies of the Albert Einstein College of Medicine in New

York, became an unofficial adviser to the NFL MTBI committee and has since shared his expertise on tau, CTE, and dementia with us on a regular basis. At one point, Dr. Davies traveled to West Virginia to review some of Dr. Omalu's materials and was given some of the material to study in his own laboratory. Dr. Davies agreed with Dr. Omalu that there is excessive tau pathology but discovered that the tau pathology differed between the cases. Dr. Davies disagreed with Dr. Omalu's conclusions that this pathology is the same as that reported by Dr. Corsellis and that the cause of this pathology is definitely multiple prior head injuries. Dr. Davies raised the possibility that the use of performance enhancing drugs such as anabolic steroids may have played a role in the development of tau deposits in the brain. Dr. Davies is currently studying this issue in his own laboratory.

Early in 2009, Dr. McKee reported a case of excessive tau deposition in the brain of a retired NFL player. She has since reported one such case in the medical literature and a number of others to the media. The NFL MTBI committee and I were immediately very concerned about the implications for the health of NFL players. We invited Dr. McKee to present the findings to the committee and she has subsequently done so on two separate occasions. Dr. McKee has shown cases of abnormal tau deposition in some retired NFL players, some men who had played college football but never played in NFL and an 18 year high school football player. Dr. McKee has stated to us that these findings can only be due to prior history of multiple head injuries. Despite the absence of any objective of any clinical data obtained on any of the subjects while they were alive, she has stated that posthumously obtained reports from families of the deceased demonstrate that many of these retired players suffer from depression and/or dementia and some suffered from drug abuse, all of which she believes were caused by this tau pathology. Based upon my frequent discussions with Dr. Davies, my own experience with the CTE of boxers, my clinical neurologic experience with concussions in athletes and with clinical neurologic diseases in non athletes, I have carefully analyzed Dr. McKee's reports. I certainly agree that some retired NFL players have abnormal tau pathology in their brains. However the cause of this pathology is still uncertain. Head trauma may be playing a role, but even if it is, we do not know if the significant head trauma occurs in childhood, adolescence or at a later time in life. The presence of tau pathology in the brain of an 18 year old high school athlete and some middle aged men who had played high school and college football but never

played in NFL certainly suggest that head trauma in adolescence may be an important factor.

There are a number of other neurologic diseases unrelated to head trauma which are characterized by excessive tau deposition in the brain. These include the frontotemporal dementias, the cause of which is most likely genetic, as well as progressive supranuclear palsy and cortical-basal degeneration, the causes of which are unknown although many researchers suspect some environmental or toxic etiology. The Chamorro Indians of Guam suffer from a disease called the Parkinson's dementia complex of Guam in which excessive brain deposition of tau is very similar to that seen in the football cases and the CTE of boxers. Extensive studies of this disease have not uncovered any genetic component or any relationship to head trauma. Some researchers believe that this Guam disease arises from a toxin in one of the native foods but others dispute this. These diseases remind us that excessive tau deposition can be caused by genetic, environmental or toxic factors in the absence of any history of head trauma. The possibility that the use of performance enhancing drugs such as anabolic steroids, growth hormone or toxic contaminants in these or other substances certainly needs to be considered in the football cases. It is important to also remember that some tau deposition can also be seen in normal aging brains.

The clinical features of these other tau diseases are much different from those reported in the football cases. Many of the patients with the other tau diseases have clinical features similar to Parkinson's disease. Many boxers with CTE have Parkinsonian features. Yet, none of the football cases have been documented to have any Parkinsonian features during life. Many patients with the other tau diseases including the CTE of boxers had dementia documented and diagnosed in life. Yet, there is no documented objective evidence of dementia in any of the football cases. Although certain behavioral problems have been a part of the clinical picture in some patients with these other tau diseases including the CTE of boxers, depression, suicidality, and drug abuse are not part of this picture. It is difficult to reconcile these facts with the claims that the tau disease of football players is a definite cause of such symptoms in the reported cases.

Depression is well known to have multiple causative factors. Heredity, early childhood life experiences, life stresses such as divorce, financial problems or chronic pain

all are important etiologic factors. There is no reason to believe that retired football players are immune from these other possible causes of depression. Dementia is also known to be linked to heredity, cognitive abilities in young adulthood, vascular risk factors such as hypertension, diabetes and heart disease, midlife obesity, alcohol/drug abuse and possibly a prior history of major head trauma. There is no reason to believe that retired football players are immune from these risk factors.

The conclusion that I have reached as a result of these analyses is that there is at present not enough valid, reliable or objective scientific evidence to prove that head impacts from professional football are the cause of chronic brain damage. Association does not prove causation.

Some have suggested that scientific evidence regarding the question at hand is conclusive and that there is no need for further research. I strongly disagree with that position. In the present state, we have a tau pathology condition that can only be diagnosed after death. When treatments that are being currently developed aimed at eliminating, preventing or inhibiting the deposition of tau in the brain become available, how will any of us know which if any football players might benefit from these treatments while they are alive if we have no way of making the diagnosis before autopsy? We need further scientific research to discover in vivo means of diagnosing tau build-up in the brain. In the present state, many assume that all football players with symptoms of depression or dementia have these as a result of tau pathology. This ignores all of the other conditions and diseases that are associated with dementia and/or depression in the general population. Such thinking does retired players a disservice by not considering the possibility that their symptoms may be related to treatable or otherwise manageable conditions rather than a condition which will inexorably lead to deterioration. At present, many assume that head injury is the only possible cause of this tau pathology condition. If we ignore the possibilities that genetic, environmental or toxic factors (e.g. the use of performance enhancing drugs) may play a role in the development of this tau condition, we may overlook strategies that ultimately could prevent its occurrence.

I have had the honor and privilege of being a member of the NFL MTBI Committee that advanced scientific knowledge of concussions and thereby improved the health and safety of NFL players. I have been a coauthor of a number of scientific articles that have been published in the peer reviewed medical

literature and that have withstood the test of time. I believe that the best way to continue to improve the health and safety of NFL players is through continued scientific research.

Recommendations:

(1) Develop in vivo methods to measure tau in the brain
(2) Continue in depth clinical examinations of retired football players
(3) Conduct in depth clinical psychological and psychiatric examinations of retired football players
(4) Determine the accurate incidence of brain dysfunctions in retired football players and the general population
(5) Conduct comprehensive medical and neurological evaluations on all football players who agree to donate their brains for study after death. This will allow reliable clinic-pathological correlations in the future.
(6) Study the long term effects of use of performance enhancing drugs on brain pathology
(7) Continue efforts to prevent concussions by improving safety equipment and making appropriate rule changes.

Mr. CONYERS. Thank you very much, Dr. Casson.

Our next witness is the president of Riddell, Mr. Dan Arment. He's a Colgate graduate, played for the Colgate Raiders as an outside linebacker for 4 years, has served as vice-president of national sales for a number of companies, and has a broad consumer marketing experience.

He joined Bell Sports in 2001 as vice-president, has previously served as Easton-Bell Sports Executive Vice-President and General Manager. Mr. Arment, we welcome you here this afternoon.

TESTIMONY OF DAN ARMENT, ASSISTANT DIRECTOR, NATIONAL FEDERATION OF STATE HIGH SCHOOL ASSOCIATIONS

Mr. ARMENT. Thank you, Mr. Chairman.

Mr. CONYERS. Pull it closer.

Mr. ARMENT. Again, thank you, Mr. Chairman, and Members of the Judiciary Committee for the opportunity to speak today.

For more than 70 years Riddell has passionately been at the forefront of providing state-of-the-art helmet technology and will continue to be in the future. That commitment is demonstrated to Riddell's parent company, Easton-Bell Sports where company researchers across all of its brands, Easton, Bell, Giro, and Riddell are constantly collaborating on the latest in head protection innovation. Riddell has significant partnerships with the NFL, the NFLPA, USA Football and American Youth Football. We have also collaborated with high-profile athletes and equipment managers at all levels and the sports medicine community to maintain the highest levels of helmet technology and advancement.

I understand that some will suggest that there has been little advancement made in football helmet technology. In fact, with the Riddell Revolution, the first helmet designed with the intent of reducing the risk of concussion, was introduced in 2002, it was the first major innovation in this direction for football helmets in 25 years. We have independent, peer-reviewed, published research in the medical journal Neurosurgery, February of 2006, showing that the Revolution reduces the risks of concussions by 31 percent when compared to traditional helmets.

As the market leader, we have always felt we have an obligation, not just as a business but in the public interest, to collaborate where possible and maintain the highest standard of innovation and research that has continued to stand the test of time, scrutiny, and independent research for nearly anyone with interest in the issue. Today, over one million high school, college, and professional players have made the switch from traditional helmets to the Revolution family of helmets.

The introductions of the Revolution Speed, Revolution IQ, and its technology are additional examples of Riddell's constant evaluation for potential new technologies in order to advance our mission of making the most protective products in the game, enhancing performance for players at all levels. That is a track record of innovation and demonstrated commitment to science and technology yet to be matched by any competitor.

Regarding Riddell's relationship with the NFL, my counterpart, Mr. Ferrara, will imply that the NFL's current testing process has

been somehow biased due to its licensing relationship with Riddell. We want to be very clear that any such insinuation is without any merit, whatsoever. Riddell had absolutely no role in the selection of the test facilities or involvement in any way in the actual tests recently conducted by the league. Riddell was made aware of the preliminary test results on December 15th, as were all other manufacturers.

It is important to note that despite read Riddell's licensing relationship with the NFL, players are not mandated to wear Riddell helmets. Each player may work with their team's equipment manager to choose their own helmet from any manufacturer. As such, Riddell has worked closely with the NFL and the NFL Players Association to provide education on the various protection and performance features of our helmets.

We need our paid players to wear our product and will receive any endorsements from players, staff or team. As such, it should be noted that Riddell helmets are the helmet of choice by approximately 80 percent of the league's players. We will continue to work closely with the NFL and NFLPA to ensure our innovation and technology provides the very best protection possible and maintains their trust in our helmets.

Thank you very much for your time.

Mr. CONYERS. Thank you very much, Mr. Arment.

Our next witness is David Halstead, technical director of the Southern Impact Research Center responsible for the technical and scientific actions of the A2LA Accredited Test Lab, as well as overseeing the technical aspects of all testing, consulting, and other services provided by SIRC staff. He's an expert in the field of head injury and helmets.

We have a long bio here, but the development of new machinery drew his attention to it, and he was hired to head of Firefighters Equipment Manufacturers Protective Clothing Division in New Jersey. He became involved with helmet projects in that New Jersey company, and he's immersed himself in the study of sports helmetry and head injury. He's also worked closely with Dr. Hoshin at Wayne State University and has become involved with several committees involved with head gear and brain injury. We welcome you to these proceedings, Mr. Halstead.

TESTIMONY OF P. DAVID HALSTEAD, TECHNICAL DIRECTOR, SOUTHERN IMPACT RESEARCH CENTER

Mr. HALSTEAD. Thank you, Mr. Chairman. Thank you, Members of the Committee; I appreciate the opportunity to be here today and address the Committee.

My name is Dave Halstead, and I teach at the University of Tennessee. I also direct the university's sports and biomechanics impact research laboratory. I am Technical Director of the Southern Impact Research Center, which is an independent accredited laboratory, and have a variety of responsibilities with various helmet committees. I am chairman of the American Society of Testing Committee For Headgear. I'm also a Technical Adviser to the National Operating Committee For Standards in Athletic Equipment.

I'd like to tell you that I'm not here representing either one of those groups today. The testing that we did on behalf of the NFL is not ASTM testing, and it is not NOC-SAE testing, nor were they involved in that activity.

I have for about 25 years worked on trying to understand brain injuries and how protective products might be used to mitigate them. The most recent testing, which I guess I'd like to discuss for the benefit of the Committee, it was based on 1990's data collected by the National Football League in which they used film analysis to understand how players were impacted, the velocities involved, and the impact locations involved. That data was published back in the nineties, and recently, helmet manufacturers made some claims about whether their helmets worked better, and I think a very reasonable question was asked and that question was asked do they work better.

So the NFL contacted me. I guess in the interests of full disclosure, I should tell you that I have worked with the NFL Players Association, I have worked for every helmet manufacturer in the United States, if not in the world probably. I don't think that makes me biased in any way. The gentlemen on each side of me are helmet manufacturers, and I've worked with both of them. In any case, the work in this case involved one additional laboratory from Canada, myself, and some guidance from Dr. David Viano who does, I believe, teach here at Wayne State and who certainly has served with the NFL in the past.

The job was really quite simple, and it was very complex if you want to get into the details of testing, but the concept was simple. Take old helmets off the field that were at least 10 years old, helmets that were being used when the original NFL study was undertaken, and test them using the new test method, new being developed quite specifically in the last 5 years, or so, called the linear impacter to deliver impacts to the helmet in different locations at different speeds in different temperatures.

The whole idea of testing the old helmets was to compare whether the new helmets performed better or worse or the same as helmets that were in use when the NFL did its original study, but that has not yet been formalized. As the test laboratory, I'm only familiar with my data. The other test laboratory and I have not shared data, but the standard deviation or the difference, if you will, between one test lab's results and the other seem to be very, very close.

I can tell you that the selection of the helmets, the selection of the impact location is completely unbiased. The data did show some very interesting things. The data will not be released until March. I'm not here to discuss the details of the data, but I can tell you that several helmets did, in fact, perform better than the baseline 10-year-old helmets, some helmets did not perform any better, and some did not perform as well.

With that said, I'm not sure how this data will be used, and that is my biggest concern. I believe the data to be valid, I believe it to be reliable, I believe it will lead to some statistically relevant inclusions about how the helmets performed. My concern is that the data would be used, perhaps, inappropriately.

I'm not sure that better performance on this test results in a significant change in player protection. I do think helmets that manage energy better are a good thing, but the direct correlation between how they perform and how a player may end up injured or not is still somewhat missing, and I think that that link has to be connected.

Even more importantly, I'm afraid that the general consensus of what's good for the NFL is good for the rest of the playing world at all levels is probably not correct. I think that as helmets get larger and heavier given the materials in use today, we don't have any magic materials that will do the same amount of work in less space, so given that the helmets get larger and heavier, this may not be a concern for a football player at the NFL level, but it is certainly a concern for my 9 year old, and just because the NFL decides to use a certain helmet or use a certain protocol to help determine which helmets should be on the field, which I can certainly get behind, having that trickle down and automatically become well, the NFL uses it, it must be the best one, and you're not using it, I think that's a real big concern that could hurt the sport.

So how the data is used and how the data is disseminated is yet to be determined; I'm not part of that. It's a concern I have that the validity of the data, however, I have no doubt about. It does accurately reflect how these helmets perform in that test scenario, and I'd be glad to answer any questions if they should arise.

[The prepared statement of Mr. Halstead follows:]

PREPARED STATEMENT OF P. DAVID HALSTEAD

Testimony Before The U. S. House Judiciary Committee Hearing on Legal Issues Relating to Football Head Injuries

Monday January 4th 2010

Mr. P. David Halstead

Mr. Chairman, members of the Judiciary Committee, I am honored to be here today. I thank you for allowing me to provide this testimony. My name is Dave Halstead. I do not have a lot of initials after my name like many others here today. I am not the typical academic, though I do teach at a major University. I am also the Technical Director of Southern Impact Research Center, (SIRC) in Rockford TN. SIRC is the only Accredited and Certified Independent Testing laboratory in the world, that I am aware of, that has the equipment specified for testing helmets to the latest NFL research program[1]. SIRC purchased this equipment approximately five years ago for the purpose of research and standards development[2].

For the last 25 years I have worked as a Research Scientist, testing, developing and evaluating protective systems for human beings. Most of this work has centered on head protection for athletes and military personnel. I am chairman of the American Society for Testing and Materials Subcommittee F08.53 on Helmets and Headgear. I am not here in that capacity today and wish to make that clear. I am also the Technical Advisory Consultant for the National Operating Committee on Standards in Athletic Equipment (NOCSAE). In this capacity I advise the NOCSAE board of directors, the NOCSAE committee and NOCSAE licensee manufacturers, on the science, research and test methods that NOCSAE promulgates in the interest of athlete safety. I am not here today in that capacity and wish to make clear that I do not speak for NOCSAE, do not serve on the NOCSAE board and further I am not authorized to represent NOCSAE at these meetings. I also wish to make clear that none of the testing conducted by me, my staff at SIRC or anyone involved in the recent NFL test battery was performed on behalf of, in conjunction with or for NOCSAE. In fact NOCSAE has had no involvement or input either directly or through others in the recent testing.

I am familiar with the NFL Committee on MTBI, but I do not and have not served on that committee, and the work completed recently on behalf of the NFL, perhaps even on behalf of the committee, did not require me to meet with the committee, or discuss the protocol with the committee. I worked with another test lab and NFL representative, Dr. David Viano who lives and works here in Michigan. I was given free rein to suggest test modifications, protocols, impact locations and impact velocities.

In the interest of full disclosure, SIRC has at one time or another, served as a technical consultant and/or independent test laboratory to every helmet manufacturer who participated in this test program. I have also served as a technical consultant to the NFLPA. I do not believe this in any way affects the objectivity of this test.

In this recent work for the NFL and its players, we worked as a small task force group of three, we created a test plan to accommodate the best use of time and equipment while still impacting helmets in a manner substantially similar to the testing described in journal publications from many years ago. Those publications outlined the mechanics, impact locations and impact velocities observed in on-field events, resulting in concussion to at least one of the players involved. The observed impacts were almost always involving plays around the ball. It could be asserted that this limited the number of available studied events to what some might call the open field or high profile event. For this, and other reasons, the most recent testing plan included impacts at impact velocities two standard deviations below the mean of 9.3 m/s, as well as one standard deviation below and one above. This resulted in impact target speeds of 5.5, 7.4, 9.3, and 11.2 m/s. The test plan resulted in several impact locations[3] to the helmeted head under four different impact speed conditions, with two temperature conditions. The testing of 14 discreet helmet models resulted in over 1200 impacts in the test matrix. At least one of each impact, on each model, was filmed at the rate of 1000 frames per second to capture slow motion video of the events. Details of mechanical failures, helmet dislodging or any unusual outcome was compiled.

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[1] SIRC is Accredited by the American Association for Laboratory Accreditation (A2LA) and is Certified as compliant to International Standards Organization 17025 for Testing Laboratories.

[2] See Photo 1 page 3

[3] See photo 2 page 3

I can speak with confidence that this testing protocol was not biased or skewed towards any helmet model, brand or type. All helmets were sized to fit the Hybrid III headform and were models available to the NFL at the time of testing. The measured performance parameters we compared against helmet models developed and in use prior to 1999. Samples from archives and samples of "old style" helmets (pre 1999 designs) were obtained from the field of play. These helmets were tested in rotation with the other or "new style" helmets. The performance of the old helmets was averaged across all samples from both labs to establish a baseline of performance. This baseline is the reference point upon which a comparison can be made to determine if the "new" models managed more or less energy than the "old" helmets in these test conditions. The data is still being reviewed; in fact I have not seen the data from the other lab, only our own data and the compiled data which shows a low standard deviation indicating good repeatability.

While specific data cannot be discussed until another, independent analysis has been completed, the results did show many "new" helmets performing better than baseline, some no better than baseline and some actually worse than baseline. The data will allow the evaluation of helmet performance in discreet locations, impact velocity conditions as well as each of the two temperature conditions.

It is clear that specific observations about helmet performance in this protocol will yield statistically valid differences in many cases. With that said the test laboratories have not been, and will not be, involved in data analysis.

Helmet manufacturers have been invited to submit additional models for a retest prior to final data analysis and publication of results.

As a test laboratory not involved in the data analysis and not being a member of any NFL committee I am not sure how the data will be disseminated or in what format.

Though I believe the data to be valid and relevant, the application of these results to the potential for reducing on-field injuries should, in my view, be approached with caution. Further, the news that a particular helmet performed well on some part of this test is likely to be widely disseminated. It must be noted that given the material and design approaches available to helmet designers today, the best, if not only, way to improve the performance of helmets in this protocol will result in larger and heavier helmets. This is not likely a concern for the professional player, but could be a much less desirable product for other levels of play.

In closing, while understanding and optimizing helmet performance is a worthwhile and necessary endeavourer, the helmet should always be considered a last resort for injury prevention, as the helmet only functions when there is an impact to the head. Helmets are indispensable devices in the prevention of catastrophic head injuries, and they work very well to reduce impact forces that are involved in concussive injuries, but helmets likely will never "prevent" concussions. Reduction in forces that may cause or contribute to concussive injury remains a goal, not a foregone conclusion.

Photo 1

Photo 2

Mr. CONYERS. Thank you for your testimony.

Our final witness in this panel is Vincent Ferrara, founder of Xenith Company that develops helmet technology and sells helmets. He, himself, was a football player at Harvard undergrad. He

received his M.D. From Harvard, and then an M.B.A. From Columbia. We're happy to have you here on the panel, sir.

TESTIMONY OF VINCENT R. FERRARA, FOUNDER AND CEO, XENITH, L.L.C.

Dr. FERRARA. Thank you, sir. Good afternoon, my name is Vin Ferrara. I'm the founder and CEO of Xenith, manufacturer of the X1 football helmet.

After playing quarterback at Harvard and graduating from the medical and business schools at Columbia University, I founded Xenith in 2004 with the goal of addressing the concussion issue for a blend of innovation and education. I've experienced concussions myself, and I know players who have been debilitated by them. I have four young children who play sports in which concussion is a risk. I feel I understand this problem and I certainly care about solving it.

At the last Congressional hearing, it was revealed that the NFL's Concussion Committee was performing yet more research, this time on helmet testing. The reaction to this testing from leading experts has included phrases like, "terrible stuff," "very bad," and "should never happen." I will try and explain this reaction.

First and foremost, Riddell is the official helmet of the NFL. For the past 20 years, this deal, which was just renewed in August just before the helmet testing started, has overwhelmingly steered players into Riddell helmets based on financially driven quotas and royalty famous to the league. This deal also mandates that the logos of non-Riddell helmets be covered up or pried off.

Given this conflict of interest and given the league's track record on concussion research, the very concept of the NFL performing independent helmet testing is inconceivable. The NFL's testing protocol, which I would argue is highly unusual and nonreproducible, is based upon a minute number of extreme, illegal, open field, helmet-to-helmet impacts that should never have happened in the first place and should be a thing of the past.

The league's preferred testing apparatus called the linear impactor, which you saw in the video before, is not an official standard, has no uniform basis for construction, and was created using Riddell helmets in one of the labs doing the testing with the lead technician listed as an inventor on Riddell patents. We're going to see the testing here.

Thus, these tests and products or products designed to mimic them, are linked in a biased way, much of the same way a test for, quote/unquote, intelligence would be biased in favor of those used to design it or those who are similar. Regardless of its results, this test would not provide any meaningful information on intelligence, and the NFL's test will not provide any meaningful information on the risk—on reducing the risk of concussion.

In fact, the measures taken in this testing are some of the same measures that Dr. David Viano, who just resigned as Co-Chairman of the NFL's Concussion Committee, yet, is still running the testing, suggest should be abolished in a 2003 conference publication. The existing standard organization, NOCSAE, for which David Halstead serves as technical director, explicitly forbids numerical comparisons because the numbers don't correlate to any particular

injury risk. Simply put, a crash test dummy cannot tell you it has blurry vision, chronic headaches, or can't remember the play.

Designing for a test is not difficult, it has been done for decades. The lab tests and player feedback are often not in sync. We have, at times, deliberately made choices in opposition to machine data based on player feedback. Our approach is to address the potential damage of repeated impacts which Dr. Omalu spoke of, while offering comparable protection at the rare extreme.

We're confident in our product, and while we will always seek improvements, we don't plan on changing our helmet based on the NFL's tests. However, NFL equipment manufacturers will make and some have already made critical safety decisions based on words that at worst, are biased, and at best, don't mean anything. These decisions will trickle down to the college, high school, and youth levels. Do the individuals responsible for this testing or those in the NFL who failed to stop it actually want to incur the potential liability associated with these decisions?

I would like the Committee to note that we have offered to the NFL Players Association as many helmets as needed at no charge to do player-based comparisons of helmet features, which would yield useful information. This is something I don't believe any other helmet manufacturer has done. But the NFL has shown no interest in this. And by the NFL, I mean Dr. Elliott Pellman, longtime Chairman of the NFL's Concussion Committee, lead author on the NFL's concussion research publications. Dr. Pellman maintains the role as, essentially, the league's singular voice on player safety and actually stated to a group of helmet manufacturers that gathering player data was, "difficult to do, and we need to do something quickly."

I believe that when things are done quickly, there's a high likelihood they will be done wrong. I believe the NFL should not be in the business of concussion research or helmet testing and should not have an official helmet. I believe that the concussion issue can be addressed through a blend of innovation and education.

I sincerely appreciate the invitation of Chairman Conyers and the House Judiciary Committee. This story is not just about football helmets. What protects football players today may protect soldiers and first responders tomorrow, or it may yield better innovations in the future. This story is ultimately about innovation and the government's role in fostering it in an effort to advance the safety of activity and health of your constituents. Thank you for the opportunity to share this information.

[The prepared statement of Dr. Ferrara follows:]

PREPARED STATEMENT OF VINCENT R. FERRARA

Legal Issues Relating to Football Head Injuries, Part II
January 4th, 2010
Testimony of Vincent R. Ferrara, MD, MBA
Founder and CEO, Xenith LLC

Good afternoon. My name is Vin Ferrara, and I am the Founder & CEO of Xenith, manufacturer of the X1 football helmet. I founded Xenith in 2004, with the mission of addressing the concussion issue through a blend of innovation and education. Prior to founding Xenith, I played quarterback at Harvard, and attended the medical and business schools at Columbia University.

I realize that head protection is only one part of a complete strategy, in which education, technique, rule enforcement, injury management, and cultural changes are paramount. We don't market our helmet as concussion proof, and we work tirelessly to prevent it from being used as a weapon. Xenith was one of the first sponsors of the Sports Legacy Institute and Boston University research on chronic traumatic encephalopathy, and for every helmet sold, Xenith will donate a dollar to concussion research through the National Athletic Trainers' Association. **I understand this problem, and I care about solving it.**

At the last congressional hearing, hours were spent discussing and criticizing the NFL concussion committee's research. However, we were also told that this same committee would be doing even more research, this time on helmets. The issues are many.

The NFL's testing protocols, implemented under the direction of Dr. Elliot Pellman and Dr. David Viano, both former chairmen of the NFL's concussion committee, are based on a very small number of "exceptionally high velocity", illegal helmet to helmet impacts, that should never have happened in the first place. I estimate these 25 hits represent only .001% of a pool of impacts that likely caused thousands of undiagnosed concussive episodes, ignored in the NFL's research, from 1996-2001. Here is one video of this testing procedure, from our lab: http://www.xenith.com/videos/Linear-Impactor.html

As you can see it's an unrealistic simulation of an extreme event. Making standards around extreme events incentivizes design for the extreme, and not for what is likely to happen. This will make the actual problem worse. With regard to helmets, extreme tests warrant stiff, dense systems, in other words exactly what players have had for the past three decades. **More of the same won't solve the problem.**

When I say more of the same, understand that since the late 1980s the NFL has had a business relationship with Riddell, which has made helmets with vinyl nitrile foam padding since the late 1970s. Riddell is deemed the "Official Helmet of the NFL." NFL players are overwhelmingly steered towards Riddell helmets based on quotas that provide teams free goods, and no logos other than Riddell can be shown on helmets. If a player wears a non-Riddell helmet, the logos for that company need to be pried off, or covered

up. I'm not an attorney, but I would ask the committee to investigate the legality of this arrangement with regard to anti-trust law.

The Riddell-NFL deal is not only legally questionable; it is ethically questionable. This deal limits player choice, stifles innovation, and influences the decisions made at the collegiate, high school, and youth levels. The NFL will tell you that it does not endorse Riddell helmets as the safest, but the average citizen would assume this must be the case. The NFL also has a strong incentive to hope and therefore espouse that Riddell helmets are the best. Any other suggestion would open up Pandora's box. The NFL doesn't want decades of players asking how this deal, which was just renewed in August 2009, might have affected their brain function.

Riddell's long relationship with the NFL plays a significant role not only in the helmet market, but also in the NFL's controversial helmet testing program. The machinery the league is using to test helmets was developed not only in response to a minimal number of extreme events, but also in large part by funding from Riddell, using Riddell helmets, at a lab listed as inventor on Riddell helmet patents, also the same lab leading the NFL's current helmet testing. When a test and a product are developed together in a lab, they all go together in a complementary way. The product and tests are inextricably linked in a way that is almost indefinable, but also quite obvious. Therefore, the will and the means both exist to encourage more of the same. **More of the same won't solve the problem.**

I will tell you now, that there is no single lab test to determine "helmet safety." Lab data is just numbers generated by a machine that doesn't simulate a person, and no lab numbers are directly correlated to concussion risk. How can a helmet comparison be performed by discussing numbers from a lab, in the NFL's boardroom, without players? One thousand people might experience the same impact, and one thousand different outcomes will occur. A crash test dummy cannot tell you it has blurry vision, feels woozy, or has chronic headaches.

In fact, the measures being made in this testing are the same measures that Dr. Viano suggests in a 2003 conference publication, that I hold here, should be abolished in favor of other measures. The existing standard organization, NOCSAE, explicitly forbids numerical comparisons because it knows the numbers don't correlate to injury risk. Make no mistake, NFL equipment managers, and therefore college, high school, and youth programs, will make and already have made decisions based on numbers that don't mean anything. Do the NFL and the individuals responsible for this testing actually want these decisions, and the liability associated with them, on their plates?

We have offered as many helmets as necessary to do player based comparisons, but thus far, the NFL has shown no interest in this. By the NFL, I mean Dr. Elliot Pellman. longtime chairman of the NFL's concussion committee, and lead author on the NFL's concussion research publications, who maintains a role allowing him wide discretion over decisions about player safety.

Dr. Pellman's own website reads, *Dr. Pellman serves as the National Football League's Medical Advisor, advising the league on medical and health matters, supervising NFL*

health committees and as the medical liaison to the league's Clubs, Competition Committee, team physicians, and athletic trainers as well as the National Football League Players Association. Dr. Pellman, essentially the league's singular voice on player safety, stated to a group of helmet manufacturers that gathering player data was "difficult to do and we need to do something quickly."

I should point out that I don't just disagree with the NFL attempting to do lab testing for comparative purposes, I disagree with any organization attempting to directly compare helmets in a lab for "safety." We need to let the free market, and an individual company's innovations and philosophies, develop without artificial restrictions. New helmet standards, that will be biased by those creating them, and may be created in a rush, will lead manufacturers to "design to the standard." Designing to the standard will hinder innovation, and will bring everyone to the same place, and we won't know if that is the right place to be.

This is not to say that testing standards are not important. We have used both the existing NOCSAE standard drop test, and the linear impactor, over the years in which we developed our helmet. We designed our technology to be deliberately more compliant and adaptive, to better address frequent low to medium energy impacts, and to provide equivalent protection to other helmets in the rare "big hits" that are now finally, thankfully, being penalized and fined. We think it is the right technology at the right time, and certainly not more of the same.

We have sold close to 15,000 helmets, and we've talked to players, parents, coaches, equipment mangers, athletic trainers, and team physicians along the way. We like what we've heard so far, including from the NFL players wearing it. I have a stack of referrals here as well an article in which Dr. Robert Cantu describes the X1 as "the greatest advance in helmet design in at least 30 years."

If you are a player, or are in any way involved in player safety, talk to companies at length. There is too much at stake to rely on lab numbers, rumors, individual opinions, or anything other than a thorough collection of information. Find out how the company developed its technology, for what purpose, and if it achieves that purpose. If anyone tries to give you a short story or one graph based on a lab test, they probably don't know what they are talking about.

I was told that by speaking out, I might be blackballed at the NFL. But how could I come here and not share information that needs to be shared? I understand that all businesses face competitive barriers, and I'm not here to seek any particular advantage. I am not here to become the official helmet of the NFL. I am not looking for an endorsement, and not interested in spending time attacking the NFL. I am looking for a level playing field, and not more of the same. **More of the same won't solve the problem.**

In the hours of testimony at the last hearing, the refrain that stuck with me most was Roger Goodell's stating "as long there are medical people involved, it's fine." As a medical person myself, I can say that simply having "medical people involved" does not make something fine. While most medical people are skilled and sincere, there are also

those who sit on the sidelines, literally and figuratively, discussing and researching a problem, but never solving it.

There were medical people involved in tying Marc Buoniconti's facemask down to his shoulder pad, putting his neck in an unsafe position before it was broken on the football field. Marc's father Nick Buoniconti, Hall of Fame linebacker from the Miami Dolphins undefeated team, is on Xenith's Board of Directors. He would have been here today, but he is holding a major hearing on spinal cord injury research, for which he and Marc have raised hundreds of millions of dollars. Nick asked me to deliver a message for him:

"The issue of traumatic neurological injury is the most important issue of our time. I speak for all players, current or retired, starter or reserve, Hall of Fame or unknown, when I say that I will not stand by quietly any longer while player safety is jeopardized by business as usual. I call on Roger Goodell to take control of this situation once and for all, instead of ceding responsibility to a committee with no track record of success."

In this era of change, there is clearly still more to be done, and Roger Goodell, not a committee of medical people, needs to do it. Roger Goodell needs to end the NFL's deal with Riddell, and end the era of NFL-sponsored concussion research. He must allow players the ability to make their own choices, not just for helmets, but for all equipment.

I am also offering my assistance to help Roger Goodell solve this major problem. I've had experiences over the course of my life that give me an understanding of this issue, beyond what can be generated in a lab or in the NFL's boardroom. I've spent the last six years, and plan to spend the next sixty, devoted to addressing this issue. I'll offer a unique perspective. **I won't offer more of the same.**

I sincerely appreciate the invitation of Congressman Conyers and the House Judiciary Committee. This story is not just about Xenith; it is ultimately about innovation, and the government's role in protecting and fostering it. For what protects football players today may one day protect other athletes, children, soldiers, first responders, and laborers. For what starts as a small company may one day grow into a large and responsible employer of many. I welcome your assistance, and look forward to helping you protect your constituents.

Mr. CONYERS. Thank you very much, Doctor, and to all of our panelists, we're indebted to you all. There are some questions that we would like to put to some of you. If Linda Sánchez is sufficiently recovered, I'll recognize her for questions.

Ms. SÁNCHEZ. I will do my best, Mr. Chairman.

I have a lot of questions for many of you, so I'm going to try and get through these as quickly as I can, and I'm going to start with Dr.—is it pronounced Maroon like the color?

Dr. MAROON. Yes.

Ms. SÁNCHEZ. Yeah, it's Maroon, and I don't mean to necessarily pick on you, but I was struck by a portion of your testimony, and I'm going to read from the written testimony, you stated, and I wanted to follow up: "Our committee—" meaning the MTI committee "—together with the NFL has long recognized that concussions can lead to long-term health issues, especially if they are not properly managed," and I would dispute that sentence that it's been "long recognized" because it seems to me that the NFL has literally been dragging its feet on this issue until the last couple of years when it came under increased scrutiny.

And this is why I say that: The committee and even the name, itself, mild traumatic brain injury, suggests a downplaying of the dangers. I would assert that there's nothing mild about traumatic brain injury, but I'm a layperson and not a doctor, and that may be a specific medical term. But the committee was comprised in 1994, specifically, you stated, due to concussions from several players that ended their careers. And yet, as early as 2005, there was paper published in Neuropsychology saying that it might be okay, it might be safe for high school players who've had a concussion to go back into the game, and it took until 2009 for the NFL to impose the new rules that if you get a concussion in the game you don't go back in to that same game. That's about 16 years in my estimation, 15 years, at least, give or take.

Why do you think it took that long for the NFL to bring about these rule changes, or am I just, you know, being crazy, that 15 years is a short amount of time?

Dr. MAROON. Well, I wouldn't suggest that you're being crazy, and I think it's a very good question, but I think there's been a considerable debate over the period of time just what constitutes a concussion, and there have been many different specialists who debate what is a mild concussion and what is a severe concussion. For instance, I'm sure you have a child, I believe.

Ms. SÁNCHEZ. A 7-month-old.

Dr. MAROON. And if you had your child wake up this morning with a temperature of 99 or 99.1, I think you would agree that that's a fever.

Ms. SÁNCHEZ. Correct.

Dr. MAROON. If your child woke up with a temperature of 105, I think you'd be considered—you would be much more alarmed.

Ms. SÁNCHEZ. I would likely be more alarmed.

Dr. MAROON. Right. So if you hit your head getting out of your car and you bump it on the jam of your—the frame of your automobile, and you're stunned, and you may see a few spots in front of your eyes, that would be considered a concussion. If you're run over by a PAT bus and are laying unconscious on the pavement, you also have a concussion. So there's all gradations of concussion, and it has been recognized by, in fact, here at Wayne State University, much of the pioneer work in concussions have been done by

Dr. Gurdjian and others in the sixties and seventies that traumatic episodes to the head results in injury. I mean it's a—it's——

Ms. SÁNCHEZ. I can accept that there are gradations of concussions.

Dr. MAROON. There are gradations of concussions.

Ms. SÁNCHEZ. I can totally accept that.

Dr. MAROON. So——

Ms. SÁNCHEZ. But in a high-impact sport like football——

Dr. MAROON. Yes.

Ms. SÁNCHEZ [continuing]. When somebody has a concussion——

Dr. MAROON. Yes.

Ms. SÁNCHEZ [continuing]. And we heard from Mr. Barney, he was out on the field for 21 minutes, then taken to the sidelines and later returned to the same game.

Dr. MAROON. That was in the 1970's.

Ms. SÁNCHEZ. I understand that, that was very early on, but I'm saying since 1994, players have been returning to the same game with concussions until the NFL just a couple months ago changed the rules and said you can no longer return to that—why did it take 15 years.

Dr. MAROON. And again, I'm telling you that they're still—in 1997, the American College of—the American Academy of Neurology published guidelines saying that if an athlete completely recovers, asymptomatic in terms of no headache, nausea, or vomiting, is able to perform aerobic activity on the sidelines without—without complaints, has no amnesia, confusion, if it's within 15 minutes, they can return to the game safely. So this is the American Academy of Neurology's guidelines in 1997.

So when the paper in Neuro—in Neurosurgery was published by Dr. Pellman and others saying that a significant percentage of athletes had gone back into the game, they had all recovered completely. We now recognize the papers that have been published in '05 by Dr. Omalu and in '06 by Dr. Omalu, it lead immediately to '07 where the NFL convened a committee and a meeting in Chicago and invited the Players' Association, the athletes, the trainers, and the team physicians and said hey, this—yeah, you're right, just like you're saying, it's a problem, what can we do about it?

Ms. SÁNCHEZ. So let me get this correct. The same research that Dr. Omalu, which gets discounted or was discounted recently as not being scientifically valid enough for some members of the MTBI committee is the same research you're now saying that helped lead to the rules change——

Dr. MAROON. I'm saying——

Ms. SÁNCHEZ [continuing]. About not allowing players to go back into the game.

Dr. MAROON. Two case reports in the literature don't make a major shift in the thinking of medicine. I mean you can't say that—you can't—yes, it's an observation, it's an important observation, but does it happen in every situation that an athlete who has a head injury is going to be demented.

Ms. SÁNCHEZ. I understand that, but if the MTBI committee in 1994 was charged with studying this issue and trying to prevent it, I just find it completely interesting that on the one hand Dr. Omalu's study has been pooh-poohed to some extent, and it's not

scientific enough and, you know, but on the other hand, what you're saying oh, well, it led us to rethink that maybe it wouldn't be a good idea to let players—I mean to me, the whole point is—was or was not one of the charges of the MTBI committee to study to see what the effects were and how to prevent them and what the best course of——

Dr. MAROON. Congresswoman—I'm sorry.

Ms. SÁNCHEZ. No, that's my question.

Dr. MAROON. No, I deeply respect your questions, but you're discounting over 20 publications published in peer reviewed journals over the course of 1994 to 2008 discussing the problems with concussion, how to prevent them, helmet design, now there's still controversy as to helmet design, as we've just heard here within the last 10 minutes, so——

Ms. SÁNCHEZ. I understand, but my question was not about helmet design——

Dr. MAROON. In 1997, the NFL commissioned the biogenetics laboratory to look at helmet design and ask the question funded by the NFL with no helmet manufacturer involved what can we do to design the helmets in a better way to protect the athletes so that I—I kind of dispute your position that nothing has been done since 1994.

Ms. SÁNCHEZ. Very little has been done—and I'm not talking—take away the helmet and the equipment testing. It seems to me that if the MTBI committee was specifically convened as a result of concussions which took some great players out of the game, that the singular focus should have been on the health and welfare of the players in terms of the effects and how to—how to assess what the treatment would be for that or what the best course of action would be after a player has suffered a concussion. That's just my opinion, and you may disagree with it, and you're entitled to do that. It's a question I would love to ask you, but I'm going to ask Dr. Casson—is it pronounced CASS-in or is it CASE-in?

Dr. CASSON. CASS-in.

Ms. SÁNCHEZ. Casson, thank you. Do you agree with Dr. Omalu's statement, and I'm quoting directly from his written testimony, it was also in his oral testimony, that the concept of permanent brain damage and dementia following repeated blows to the head is a very well established and generally accepted principle in medicine; would you agree with that statement.

Dr. CASSON. There's a lot more you have to say about yes, I agree, or no, I don't agree. Are you talking about in boxing? Yes, it's rel——

Ms. SÁNCHEZ. No, no, no, it's not sports specific, it's not even specific to sports. It's generally speaking, and I'll repeat the quote, "The concept of permanent brain damage and dementia following repeated blows to the head—" could be blows of any kind, could be a blunt object, it could be, you know, blows from multiple car crashes, perhaps, "—is a very well established and generally accepted principle in medicine."

Dr. CASSON. First of all, let me say this. You don't determine scientific or medical truth by popular vote. You don't determine it by consensus. You determine it by evidence. Now——

Ms. SÁNCHEZ. I understand that, and I understand that I'm not a doctor, but I'm just asking if you accept a statement that Dr. Omalu has said is generally accepted in principle.

Dr. CASSON. No, there are specifics you need to know but before you say that. You can't just generalize like that. It is accepted in the sport of boxing. It's accepted in a few other circumstances. It's not necessarily generally accepted in all the football players. Now, have there been a few cases that maybe it's true? Yes. But we need more evidence. Just because there's an association does not prove causation.

Ms. SÁNCHEZ. So would you disagree that if somebody were repeatedly hit in the head with a blunt object that there likely would not be permanent brain damage and/or dementia that would be associated with that.

Dr. CASSON. I'm a physician. I've been treating patients like this for my entire career. I trained at Bellevue where I have the primary responsibility for the care of hundreds, if not thousands, of head injury victims of all severities during my residency program. I have a great deal of clinical experience in this field. You cannot generalize. Every case is different.

Ms. SÁNCHEZ. Okay. All right. I can't get you to agree on something that I think most laymen, probably most physicians would agree to that, if somebody suffers repeated blows to the head, there is going to be some kind of brain damage.

Dr. CASSON. You said dementia.

Ms. SÁNCHEZ. Or dementia even.

Dr. CASSON. Well, dementia is a specific type of brain damage. The specific clinical——

Ms. SÁNCHEZ. Well, pardon me, pardon me, I said permanent brain damage and/or dementia.

Dr. CASSON. We can disagree.

Ms. SÁNCHEZ. Okay. All right. Now, in your testimony, you're very clear about talking about your past experience and studying the effects of head trauma in boxers in which you conclude that: "Modern era retired boxers had signs of chronic brain damage."

I'm interested in knowing how the repeated head trauma in boxers is different from the head trauma that's suffered by those in professional football or some other activity where there's repeated blows to the head.

Dr. CASSON. Okay. First of all, there have been studies that have demonstrated that the head trauma in boxing has much more rotational forces and accelerations compared to football concussions which are more translational in nature, meaning more straight lined rather than rotational. There have been studies published that have documented that.

Another difference, secondly, boxers don't wear helmets, football players do. Thirdly, boxers are subjected to constant repetitive blows from the time they start boxing all through their careers in sparring, in training, as well as in their fights over very long periods of times, and sustained more blows causing rotational forces in a career than football players do, so there clearly are differences——

Ms. SÁNCHEZ. Those are the three major differences, would be those three then.

Dr. CASSON. Those are three differences.

Ms. SÁNCHEZ. Okay, all right.

Dr. Klossner, I'd like to ask you, you testified to the steps the NCAA has been taking to treat concussions including the fact that you're recommending that rules be put in place for all sports. Is it your opinion that the effects of repeated head trauma are consistent across sports, for example? Are the concerns expressed by those who play—by a football player getting a concussion and returning too soon to the game also applicable, to, say, a women soccer player who might suffer a concussion during the course of——

Mr. KLOSSNER. Well, I'd have to defer the medical opinion of what happens with a student athlete who——

Ms. SÁNCHEZ. But is it——

Mr. KLOSSNER [continuing]. Receives a concussion but——

Ms. SÁNCHEZ [continuing]. Is the concern the same?

Mr. KLOSSNER. The prevalence of concussion from what we measure from the NCAA injury surveillance system notes concussions occur across sports, yes.

Ms. SÁNCHEZ. But is the concern the same that the NCAA has that if you're a football player who gets a concussion and is thinking about returning to play, are you any less concerned that it might be a, say, a woman soccer player who gets a concussion during a game and might——

Mr. KLOSSNER. Our guidelines apply to all student athletes the same.

Ms. SÁNCHEZ. So it applies to every sport and every student athlete.

Mr. KLOSSNER. That's correct.

Ms. SÁNCHEZ. Okay.

Dr. Casson, in going back to you, in your testimony, you didn't state definitively whether you feel that repeated concussions have a long-term health impact and I'm interested in knowing, yes or no, in your opinion, do you repeated head impacts, regardless of where or how they occur lead to long-term brain damage?

Dr. CASSON. That is not a yes-or-no question. Maybe in certain circumstances.

Ms. SÁNCHEZ. Maybe, okay.

Dr. CASSON. Yes, because you have to take each individual case and the facts, that's what a physician does, that's what a scientist does——

Ms. SÁNCHEZ. I understand that but—so repeated concussions, if somebody has multiple concussions, regardless of how they got the concussions, you couldn't say that you'd feel confident to say that it would lead to brain damage.

Dr. CASSON. It very well might. I'm not saying that having concussions is good for you, it's not. It's bad for the brain to have a concussion.

Ms. SÁNCHEZ. Well, that's the strongest statement I've gotten you to make on concussions, you know, since you've been here today.

Dr. CASSON. No, it's really not. What I stated——

Ms. SÁNCHEZ. In my opinion, it is.

Dr. CASSON. Well, in my opinion, there's not enough scientific evidence to jump to the conclusions that many people have done. I'm a scientist——

Ms. SÁNCHEZ. How many——

Dr. CASSON.—I follow the evidence.

Ms. SÁNCHEZ. Okay, I'm not even going to ask the question I was going to ask, I'm just going to ask you one last question. You made a series of recommendations at the end of your testimony for what you believe could be done to further the study of the effects of concussions. In your time on the MTBI committee, did you ever make these recommendations to the NFL.

Dr. CASSON. Yes, we talked about trying to develop in vivo methods to measure tau in the brain, that was done very recently. We have an NFL Retired Players Study that's now on hold, unfortunately, which was to—in-depth clinical examinations of retired football players. We had talked about and we do have, as part of that study, psychiatric/psychological evaluations to some extent, we talked about at a later date expanding that to do a more detailed psychological and psychiatric evaluations.

One of the goals of the NFL Retired Players Study is to determine the accurate incidence of brain dysfunction in retired football players, so yes.

Ms. SÁNCHEZ. So those recommendations were made, but they were very made very recently; is that what you're telling me.

Dr. CASSON. No, the NFL Retired Players Study we began formulating in 2003, so no, it was not made very recently. Now the idea that comprehensive——

Ms. SÁNCHEZ. As compared with 1994, I would say that's——

Dr. CASSON. Well, one of the reasons that I was asked to be on the NFL Retired Player Committee was because of my expertise with CTE of boxers. I know a lot about this field, I have expertise in this field. When we started this committee, the goal of the committee was to advance the scientific medical knowledge of concussions and thereby improve the health and safety of NFL players. That is the way you improve health and safety, by advancing the science, and that's what we set out to do.

Now you can't start doing everything at once. We started with biomechanical studies, we started with epidemiological studies of concussion in the NFL. Then we moved on to studying retired players. So you can't do everything at once. You have to have a plan, and that was the plan, and that's what we were following.

Ms. SÁNCHEZ. Okay, one last question for you, Dr. Casson. In January of 2005, you along with Dr. David Viano and three other authors published an—I referenced it earlier in the Journal of Neurosurgery a paper that said it might be safe for high school football players who sustained concussions to return to the game in which they were injured. Do you believe today that it's okay for athletes in their teens whose brains are still developing to return to play in the same game after suffering a concussion?

Dr. CASSON. I'm glad you asked me that question. In that paper, we never suggested that it was okay for high school players to return to play on the day of an injury. We had done a scientific study analyzing the epidemiology of concussion in the NFL. It was aimed at, the study, specifically in this paper, the group of players who

had returned to play on the date of injury to see if they were any different than the players who had not returned to play to see what happened to them, to see how they—whether they had more concussions down the road or had repeat concussions. We specifically stated in this paper and every one of our epidemiological papers that these studies were on NFL players, and the results applied only to NFL players.

Now, in the discussion of a scientific paper, very often what scientists will then do in discussing the data is raise questions that, maybe, other people want to look at to try to get other people to study the field, and what we suggested that was that no one has studied this in high school players or college players, and it might be interesting for someone to look at it. That's what we said. We didn't say it was okay.

Ms. SÁNCHEZ. But you did say that it may be safe.

Dr. CASSON. What we said—the idea was that they—we don't have evidence. What we said was we need evidence.

Ms. SÁNCHEZ. But you never used the words that it may be safe.

Dr. CASSON. I may have used those words. Even if we said may be, the operative word is may be.

Ms. SÁNCHEZ. I understand, but today do you hold that same opinion.

Dr. CASSON. That wasn't my opinion. My opinion was——

Ms. SÁNCHEZ. Is your opinion today that it may be safe for high school football players who've suffered a concussion to go back into the same game? Your opinion——

Dr. CASSON. Without evidence stating one way or the other, you can't answer that question.

Ms. SÁNCHEZ. Okay. All right.

Dr. CASSON. There's no evidence.

Ms. SÁNCHEZ. Okay. Back to Dr. Klossner. In your testimony, you stated that student athletes rightfully assume that precautions have been made to minimize the risk of injury. Can you talk about what the NCAA does to educate student athletes about the risk of concussions.

Mr. KLOSSNER. From the NCAA's perspective, we have an NCAA sports medicine handbook that has a guideline on concussions that outlines the risks associated with concussions and return-to-play concerns that is provided to all member institutions that help educate their student athletes on the rules of concussions in sports.

Member institutions have responsibility to educate their student athletes. At the end of the day, they make the decisions of what happens with their student athletes and how they educate them on various topics related to their student athlete health.

Ms. SÁNCHEZ. Is there any kind of release that students are required to sign in order to participate in sports other than saying that they understand the risks of concussions.

Mr. KLOSSNER. Those, again, are what the individual institutions decide on how they medically release or provide intent-to-play waivers.

Ms. SÁNCHEZ. In your knowledge, are there some institutions that require that.

Mr. KLOSSNER. Yes.

Ms. SÁNCHEZ. Okay, that's what I'm getting at.

Dr. Omalu, you have mentioned the risk of subconcussions. Can you elaborate a little bit on the subconcussions and what we can do to identify and treat their effects?

Dr. OMALU. Well, every day I examine the brains of human beings, I've examined thousands of brains. The brain is made up of about 80 percent water. God, in his infinite wisdom, did not create a brain which floats freely in our skulls to receive repeated impact. So any impact, no matter how similarly that it could be that makes your brain accelerate/decelerate, the very basic laws of physics in issue, acceleration/deceleration causes disruption of the proteins which are floating in water, and we see that with the evidence since the 1970's at the Institute of Neurological Sciences in Scotland results in damages to the brain cells and their fibers. When they examined these brains, you see accumulations of abnormal proteins, at least an hour from when the injury. And unfortunately, many times this impact wouldn't present with incapacitating symptoms to manifest with headaches that the individual would dismiss——

Ms. SÁNCHEZ. Right.

Dr. OMALU. But on the cellular level, there is extensive damage which may be why we did not identify this disease early enough. Because on CT scan, the brain would look normal. On MRI, the brain would look normal, the symptoms—there are no symptoms, but on a cellular level, a lot is going on.

You saw Mike Webster's brain. Mike Webster's brain looked normal, and I repeat, looked normal, but Mike Webster's brain on the cellular level and other brains I've looked at were extensively, extensively damaged. Every impact to your head has the capacity to result in damage, at least on a cellular level.

Ms. SÁNCHEZ. So would it be your opinion that repeated impacts to the head would cause some kind of brain damage?

Dr. OMALU. Yes, this has been established since the early 20th century. In fact, Dr. Harrison Macklin (ph.), who was a forensic pathologist in New York, New Jersey, just like me, described dementia in 1928. Proteins will build up in the brain as described by Dr. Alzheimer in 1918, and in 1969, Dr. Roberts that was commissioned by the House of—House of Lords in England published a paper and a position paper by the Royal College of Medicine in England that repeated blows to the head, no matter how similarly the knock was, has the capacity to result in permanent brain damage, and in the journal Lancet in 1976, it was clearly stated that repeated blows to the head could result—in boxers could result in damage, repeated blows to the head in other activities, cellular and otherwise, can also result in permanent brain damage.

The issue here we should not make the mistakes of the past like Mr. Barney said. The issue here is not really the concussions because the concussion is the extreme.

Ms. SÁNCHEZ. Right.

Dr. OMALU. It is the innocuous repeated blows, repeated blows. In football, players are subjected sometimes to 200—or to 120 g force. That is a lot of force, a lot of energy for a brain that is 80 percent water.

Ms. SÁNCHEZ. So in your opinion, do you think that repeated concussions, then, if concussions are the most extreme of the brain dis-

ruptions that you're talking about in terms of even minor blows to the head, do you feel confident in saying that repeated concussions would lead to permanent brain damage?

Dr. OMALU. Yes, but Dr. Julian Bailes, my director at the Injury Research Institute with some other authors, Dr. Tuszkiewicz came up with the threshold of three, three documented concussions increase your risk significantly. In my practice, as a forensic pathologist, I have seen severe brain damage from even one major concussion. Like Dr. Casson has said, yes, there is a genetic variation, there are ameliorating factors, there are accentuating factors, but the established fact is that repeated blows to your head to a brain that floats freely inside your skull to the brain that is made up of 80 percent water could result in permanent brain damage.

Ms. SÁNCHEZ. Thank you, Doctor, and last and final question for you, what are your thoughts about the changes to the NFL policy toward concussions that have occurred since our October hearing on this issue.

Dr. OMALU. If you notice in my recent statement, my global statement, I had—especially my recent statement, I had stated we should not make the same mistakes of the past. We should base guidelines, policies, and protocols on the science, especially pathology. Neuropathologists since 19—1980, I believe, papers were published by Dr. Graham, Dr. Geddes, and Dr. Adams who are all Scottish men, that if you suffer a concussion or a blow to your head, amyloid precursor protein, this is a protein in very big protonated brain cells, would accumulate from about 1 hour to 3 hours. These proteins do not disappear in your brain until about 99 days; I would usually say 3 months.

So if we have pathologic evidence since 1980 that tells us the brain cells do not recover from a concussion till about 3 months, then the question leads now what is the basis, scientific basis for the 2-week, 3-week, 4-week threshold for a player to go back to play? And again, I would always advise the absence of symptoms does not mean the brain has recovered from a concussion.

Ms. SÁNCHEZ. Thank you.

Dr. OMALU. The neurological evidence confirms that, neuropathological evidence confirms that.

Ms. SÁNCHEZ. Thank you, Dr. Omalu, I think your testimony has been most instructive, and with that, I would yield back my time to the Chairman.

Dr. OMALU. Thank you.

Mr. CONYERS. Thank you very much. I'm pleased now to recognize Steve Cohen, a distinguished Subcommittee Chairman on the Committee of Judiciary.

Mr. COHEN. Thank you, Mr. Chairman, and not that it's important at all, but I think I referred to the GMAC Bowl as the Motor City Bowl. I'm in the city of the Motor City Bowl, I have corrected it.

Dr. Maroon, Mississippi State, several weeks ago, Mr. Aieello—Aiello?

Dr. MAROON. Yes.

Mr. COHEN [continuing]. Of the NFL, spokesperson for the NFL said that it's quite obvious from the medical research that's been

done that concussions can lead to long-term problems. He said—I believe that is accurate. Are you familiar with that quote from him.

Dr. MAROON. Yes.

Mr. COHEN. That—is that a conflict of what Dr. Casson has told us that there is at present not valid, reliable, or objective scientific evidence that prove that impacts from professional football are—cause chronic brain damage, aren't those kind of——

Dr. MAROON. No, I don't think they're incompatible at all. I think what I heard Dr. Casson saying is that you have to evaluate several factors, and going back to what Dr. Omalu said, he said it has to be based on science, right? And as the—I gave the example to Congresswoman Sánchez that if you have a temperature of 99, you have a fever, if you have 106 and you're in heat stroke in an ICU, you have fever. There's huge variations in what a concussion is and the severity of the concussion so that there are very, very minor bumps on the head that I don't think lead to permanent dementia and incapacitation, even if there are several of these.

One concussion, on the other hand, may, indeed, lead to permanent brain damage. In our clinic at the University of Pittsburgh, we see approximately 100 to 150 kids a week for postconcussion syndrome evaluation. So when you ask me can head injuries—can concussions lead to significant long-term effects, there's no question that it can. But I guess going back to Dr. Omalu's work, it has to be based on science, and he says 2 months, 3 months, how do you base when an individual may go back to play?

Well, going back to one of the comments of Congresswoman Sánchez, initially, you mentioned the Pittsburgh Steelers and the Bengals game in your introduction, and I think you were referring to the quarterback of the Pittsburgh Steelers who was not permitted to play in a very critical game because under exertion, he developed headaches, and under the guidelines, we know that the brain has not completely recovered.

Not guidelines, but the science has shown us that if you remain symptomatic, you haven't recovered, and consequently, the neurocognitive tests which assess the processing information and processing power of the brain are—are objective criteria that were evaluated beginning in 1990 when Coach Knoll and Dan Rooney from the Pittsburgh Steelers told me Maroon, I don't care what you know about or what you think about a concussion, I want objective data.

And that's why Impact was formed because it gives you objective data, so that I think they're not inconsistent, his—his comments with the questions that were asked.

Ms. SÁNCHEZ. Will the gentleman yield.

Mr. COHEN. Yes.

Ms. SÁNCHEZ. And I appreciate that, I just want to make this point. Dr. Omalu testified that a person can be asymptomatic. In that instance, he was symptomatic because under stress, there was a problem. Asymptomatic and not fully recovered in the brain, and I just wanted to point out that important distinction. I now will yield back.

Mr. COHEN. Thank you.

Let me ask you this. Dr. Casson—and I respect your study and your concern here. You said that association does not prove causation, right?

Dr. CASSON. Yes, that's a principle of scientific evidence, yes.

Mr. COHEN. But can't association—would not association possibly be sufficient to give people cause for concern, alarm, probable cause.

Dr. CASSON. Yes, there is cause for concern, but I'm a scientist, and I'm a physician. Scientists and physicians need more than that.

Mr. COHEN. Right. And I understand what you're saying to come to a conclusion in your field and in your beliefs and studies, but when you have lives in the balance, don't you think that maybe association should be sufficient to dictate that there be a change in the practice to protect these lives? I mean, you know, to err on the said of caution.

Dr. CASSON. Well, in all my involvement on the MTBI committee, we have always erred on the side of caution. In all my years of clinical practice, I've always acted in the best—for the best benefits of my patients by erring on the side of caution. However, that is not the same as saying that the science proves the point, that the science is there. It doesn't prove that one thing causes the other.

Mr. COHEN. It may not prove it, and I'm not—you know and Dr. Omalu have different opinions, and others may, too, but there is sufficient proof, I believe, you would agree, that there is an issue, there's at least probable cause or there's reason to believe that there could be a problem, and so if you err on the side of caution, shouldn't maybe you in your studies or the NFL earlier had set some policy about players maybe not staying in the game when they had a concussion or getting better helmets or something to protect the players before that?

Dr. CASSON. We did subsequently get the helmets back in the mid 1990's——

Mr. COHEN. Crash helmets, let's go to concussions.

Dr. CASSON. What we did was we studied the prevailing practice in the NFL and scientific studies of what would happen to these players, the epidemiology of the ones who had concussion. We came up with a definition of concussion that was extremely broad and was extremely all encompassing, so we picked up all of the injuries that could get reported, even the mildest of injuries of people who would be dizzy for a few seconds, if they told the trainer, that would become a concussion, so you had very mild events that were reported, and we studied these, and we did epidemiologic studies, we studied the data and analyzed what happened to these people, and based upon these analyses, we then, once we had the science and the evidence, made recommendations of how to proceed.

For example, at that time, the American Academy of Neurology guidelines, which is still in force today, were that a player who has a concussion, not even just a professional player, any player who has a concussion and gets hit in the head and has some symptoms, if the symptoms fully resolve in 15 minutes and there was no loss of consciousness, that player was allowed to return to play without even seeing a doctor.

At the NFL level, no player was allowed to return to play once it was reported, if they reported it, without being cleared by a physician. So we were, in a sense, running a system that was in opposition to what was a standard guideline that everybody was following, and we found that guideline wasn't really good enough, and nowadays, nobody believes in that guideline.

Mr. COHEN. How many years did that study take place before you came to that guideline.

Dr. CASSON. Well, we didn't come to it—before we made the recommendation.

Mr. COHEN. Yeah.

Dr. CASSON. Well, we started doing the studies in the nineties. It took us 6 years of data to collect, so from '97 through 2001, we collected the data, and then we took a year or two to analyze the data and publish it. They were published, I believe it was 2002, it might have been 2003, we began to publish the data.

Mr. COHEN. And I don't disagree with your concern for science, and with all, you know, deference to Jackson Brown who—and that lives in the balance for a different circumstances—the 10 years that it went on, there were a whole lot of football players getting concussions, and while you were doing, which is commendable, your study, and fine tuning your research and coming down with exactly what you think, players are getting hit and hit and hit and hit, shouldn't there have been, maybe, some concern 10 years earlier that said let's err on the side of caution, we know that, you know——

Dr. CASSON. Of course there was——

Mr. COHEN [continuing]. Boxers get pummeled and football players are getting pummeled.

Dr. CASSON. Of course there was concern. The standard of treatment in the NFL from the time the committee was founded was that players would not—were not allowed to return to play on the day of injury until they were asymptomatic with a fully normal neurologic examination. That was a—what the NFL physicians practiced, and that was a standard of care that was probably better than the standard of care than anybody else in any other sports league was using at the time.

Mr. COHEN. You suggested that possibly the reason for this tau being developed in the players might be because of anabolic steroids, the possibility, growth hormones, or other toxic contaminants; is that correct.

Dr. CASSON. That's certainly a possibility, yes.

Mr. COHEN. And I'm sure it may be a possibility. Who here—and I don't know, y'all look so young, you excluded, you're my age, the rest of you, when did they start using anabolic steroids in football?

Mr. Barney, do you have an idea when they started doing that?

Mr. BARNEY. The first time me hearing of it was about '64-'65.

Mr. COHEN. So it's been a long time.

Mr. BARNEY. Mm-hmm.

Mr. COHEN. Were there players that maybe were playing in the fifties or early sixties and didn't go into the six—later on who wouldn't have been exposed to anabolic steroids who developed these problems, Dr. Omalu.

Dr. OMALU. Yes. The literature, especially in boxers. I must emphasize that this again, from the United States, literature outside—coming out of the United Kingdom and Europe, even while I was a medical student in Nigeria, establishes this causation, these associations of traumatic brain injury, permanent brain damage in boxers, in other sports, contacting sports, and in other activities involving impacts to the head, even the so-called punch drunk wife syndrome, a woman who has been beaten repeatedly by the husband, the issue is repeated transference of kinetic energy to the brain. That is 80 percent water that is bouncing around in the skull.

And again, in forensic pathology and in law, there is what we call the underlying cause and contributing factors. There is no single disease, and I repeat, there is no single disease that has only one exclusive cause. An example is diabetes. Diabetes is caused by the lack of insulin. However, if you ever obese, it increases your risk of suffering diabetes, but it does not mean that obesity causes diabetes.

The same applies to chronic traumatic encephalopathy. Underlying cause is not football, it may happen in the game of football, but repeated impacts and transference of energy to the brain. Could there be other contemporaneous or simultaneous factors that would either aggravate the lethality of the disease or ameliorate the lethality of the disease? Of course. Could genetic predisposition be present? Of course. Like in every other disease model.

Mr. COHEN. So what you're saying is that maybe—you're saying a lot, but one of the things I'm trying to get at is that prior to the use of anabolic steroids, which is, give or take, somewhere in the middle sixties or whatever, there were football players, the Leo Nominellies, or whatever in the fifties who could have had some type of—or you know had some brain damage.

Dr. OMALU. Yes, there were football players that manifest that symptoms of the cases that I have done, yes.

Mr. COHEN. So it wouldn't have been anabolic steroids or growth hormones because those were not factors for those players?

Dr. OMALU. Yes.

Mr. COHEN. And Dr. Casson, you say—and I find your study interesting, "It's important to also remember that some tau deposition can also be seen in normal aging brains," well, I mean sure it is. Take that case of boxers, I mean you're kind of saying because people with normal aging brains can have tau, then that says that this may not be the reason why football players have it, with that theory, he could never say why anybody has it because it's normal aging.

How many boxers have you studied in your career?

Dr. CASSON. Well, my study that was published in JAMA had 17.

Mr. COHEN. Seventeen boxers.

Dr. CASSON. My study in the years up to that time and after that study, close to a hundred.

Mr. COHEN. Haven't some of the studies on the football players—have you not criticized them because they weren't broad enough and enough participants, the data was too limited.

Dr. CASSON. You're talking about the survey studies.

Mr. COHEN. Yes, sir.

Dr. CASSON. The survey——

Mr. COHEN. The surveys were mail-ins, but aren't there some scientific, like Dr. Omalu, some study on brains or BU's? Is there——

Dr. CASSON. Well, there have been a lot of criticisms. I'm not sure which criticism you're asking about. One of the criticisms is that there are no contemporaneously obtained objective medical data on anybody. There's no doctors' reports. There's no postneurologic exams, there's no reports of psychiatric exams in what's been published in the literature.

It all comes from talking to the family members afterwards. I'm not minimizing what family members might say and the suffering that they have gone through, but you need objective, scientific, medical examinations and studies so you can try to see if there's a clinical correlation between what you're finding in the brain and the clinical picture of the subjects, and that's not available.

Mr. COHEN. You and Dr. Viano have both resigned from the concussion committee; is that correct.

Dr. CASSON. Yes.

Mr. COHEN. What were the circumstances surrounding that, and was this a voluntary resignation.

Dr. CASSON. I can speak for me, okay? The topic of concussions, as you well know, has recently become highly politicized. Scientific considerations took a back seat to political media and labor relations issue. Personal attacks upon me were distracting from the central issue of my role on the committee, which was to improve the health and safety of the players.

Throughout my years on the committee, my main goal was to advance the medical, scientific knowledge of concussions to help improve the health and safety of the players. The commissioner and I agreed that the best way to allow the committee to continue to do that work was for me to resign, so, hopefully, the distraction of me being there would help them get back on being able to focus on the science.

Mr. COHEN. Well, you agree that the new NFL policy is wise; do you not.

Dr. CASSON. Which NFL policy are you talking about.

Mr. COHEN. This new one about you get out of the game if you have a concussion, and you have to have an independent doctor, etcetera, etcetera, etcetera, the one that came out, I think, last month.

Dr. CASSON. There are a number of different parts to that policy.

Mr. COHEN. Which do you agree with.

Dr. CASSON. Well, certainly, that certain players with certain types of concussions should not be allowed to return to the play on the day of the game.

Mr. COHEN. And which do you disagree with.

Dr. CASSON. I don't necessarily disagree with any of the policies; however, the idea that independent neurological examinations by independent—"independent neurologists" is going to give you a better result than the evidence-based experience that we know that NFL team doctors have been exhibiting throughout the years—because we have studies documenting the efficacy of their decisions—we don't know what the results are going to be of these independent neurologic examinations.

We don't know if these independent neurologists have expertise in head injury. We don't know if their opinions are going to be valid and reliable and stand up to scrutiny. We do know that the NFL team physicians' decisions have stood up to scientific study because we've published those studies.

Mr. COHEN. I respect you as a doctor, I respect the positions and the study you've done, and your work, and I'm sure you're an outstanding physician, and I have no question about that and as a researcher, but you condemn, somewhat, which is my particular avocation—or vocation, excuse me—politics, and you said that the politicization of this issue has harmed the scientific study. But without the quote/unquote politicization of this issue, none of these changes in policy that you agree with would have taken place.

So isn't politicization a little bit more important, just like erring on the side of caution and lives in the balance rather than waiting for the ultimate perfect scientific data and how many more football players might have brain damage? And I would submit to you, sir, that these areas and the quote/unquote politicization have caused the NFL to do the right thing that they might not otherwise have done. And your research at some point might get them to do the same thing, but in the interim, there are players who are being used without precautions that are in—that I think are advisable. And so, you know, I'd just—I've got to question some of your research here or some of your conclusions——

Dr. CASSON. Let me just say in response to what you just said——

Mr. COHEN. Yes, sir.

Dr. CASSON. I'm a scientist, I'm not a politician, I'm not a labor negotiator, I'm not a media expert, so I can speak to the science. I don't have the expertise to speak to those other issues.

Mr. COHEN. But don't you think the science is leading us in a certain direction? I mean you might not be able to put the stamp there and say it's done, finished, Warren Commission, case closed, but don't you think it's leading us somewhere, and don't you think there's a point to where the evidence tilts? There's a preponderance of the evidence, there's—you know, chancery court's different than a criminal court, preponderance of the evidence.

Dr. CASSON. Preponderance of the evidence is a legal term. Again, I——

Mr. COHEN. More likely than not, more likely than not.

Dr. CASSON. I'm a scientist, I don't see enough evidence to make that statement at this time.

Mr. COHEN. Well, as a scientist, don't you want to see like guilt beyond a reasonable doubt? Aren't you looking for, like, the——

Dr. CASSON. No, I'm looking for evidence.

Mr. COHEN. You're looking for what you can firmly say without question. But you're talking about lives and brains. Don't you think at some point you say let's put some changes in here, let's do something because, obviously, we've got a problem.

Dr. CASSON. And certainly, as I said before, since the time of the inception of the committee, we've been doing that, the committee did that, and the characterization that the committee was doing nothing, the characterization that the NFL physicians were ignoring this problem and blatantly sending players back in to play

without concern for their health, I submit to you, is completely incorrect, and we have scientific data to verify that that's incorrect.

I think that the NFL MTBI committee has been mischaracterized and has been given a bad, I don't know what you want to say about it, has been given a lot of bad press and a lot of bad things have been said about it because of political media and labor concerns that really don't have anything to do with the science and the real work of the committee.

Mr. COHEN. Mr. Barney, let me ask you something back to anabolic steroids. Whether or not they or hormone growth drugs that folks are taking might have some effect on their brains, does that not make football players bigger, stronger, and when they hurl themselves at the opposite player a more dangerous force.

Do you need a mic? Thank you, sir.

Mr. BARNEY. Thank you, Dr. Omalu and Chairman Cohen, I have no idea, in sincerity, about the anabolic steroids only other than what I've read about them, what I've heard other players talk about, it was something that was somewhat wiped out when I got into the league. Not totally wiped out because of certain ball players were crippled by it, but I never had a chance to see it, don't know what it looks like, don't want to know what it looks like, either, but understanding what it would do to you, it was almost like an hallucination trip, and you thought you were still bombed on the planet, that's what I heard one ball player say.

Mr. COHEN. Thank you, sir. I've just—you know, I've watched, and I just see it, and back to what Ms. Sánchez says, it's hard to fathom when you watch the game, and I love it, I mean they are so much larger, the players, and it's, you know, linemen used to be in college, 210. Now, you know, they're 310 and more.

Mr. BARNEY. Yeah, they're 210 in middle school now.

Mr. COHEN. Yeah. It's just—I understand science, but it doesn't—I don't think it really takes a scientist of the nature of the caliber and the brilliance of Dr. Casson to tell you that something's happening, and it necessarily good.

Mr. BARNEY. Absolutely.

Mr. COHEN. Yeah, I'm just kind of there. Let me ask you, Mr. Ferrara, about the helmets. Do you think your helmet's a good helmet, you're going to save some players some concussions.

Mr. FERRARA. Sir, I've spent the entire 15—last 15 or 16 years building up to this moment. I certainly wouldn't be in business if I didn't feel like our helmet could do a better job.

Mr. COHEN. Mr. Halstead said that you shouldn't necessarily take some example of a better helmet that weighs more in an NFL standard and apply it to these lesser, I guess, college but you were probably talking about high school, or something, kids, but aren't the pro players bigger, stronger, more likely to take anabolic steroids, and a more dangerous ball player than you might have in a pee wee league.

I thought some of my political opponents were here.

[Recess.]

Mr. COHEN. But pro football's a different caliber and more violent, so shouldn't—that helmet there wouldn't necessarily be the helmet you want to have used in high school because of the potential damage.

Mr. FERRARA. It's very important to point out what you actually want a helmet to do. What causes brain injury is actually sudden movement of the head. So we're talking about impact. It's really important to understand that it's the motion that results from the impact that would cause the damage. And all things being equal, more sudden movement means more damage.

So what you want a helmet to do is actually minimize how suddenly the head moves. In order to do that, it actually needs to adapt to impacts in different energies and different directions. What happens in the NFL, and it is quite extreme, and the NFL's testing protocol is based upon the most extreme events and the most extreme circumstances. Designing for the extreme will lead to worse performance in normal circumstances, and while I'm in Detroit, if I can use an automotive analogy.

What you really want the helmet to do is apply the brakes to whatever's being impacted. If the government were to come along and say we're setting a new standard for automotive brakes and those brakes need to stop a Mack truck travelling 70 miles an hour in 50 feet, you can imagine the brakes that would be needed to do that would be incredibly massive and powerful. If you put those brakes on a Honda Civic traveling 35 miles an hour, that car would actually be undrivable. It, in fact, would be dangerous. As soon as you touched the brakes, the driver would jolt forward.

And that's what's happening to the brain when you use extreme engineering. The head jolts to a stop, and the brain jolts forward. So extreme events are not a good basis for construction.

Mr. COHEN. Thank you, sir, and to be fair to Mr. Arment here, you—I had a Riddell, I mean that was kind of standard in 1966 when I made that famous catch that you missed, Chairman Conyers, but can even your helmet, which is kind of a standard, can it be improved upon to protect the players.

Mr. ARMENT. Well, I think, you know, that with ongoing research and ongoing partnerships and some of the information that's coming out of the hearings today, clearly, helmets can be improved, and we continue it at Easton-Bell Sports and Riddell to really drive to what is the next level of technology, what is the next improvement that we can make to, you know, offer further protection and performance products for our, you know, our athletes.

Mr. COHEN. Thank you. Mr. Klossner, let me ask you a question. We had this situation at Texas Tech, and while Dr. Maroon suggested, maybe, that some causation, it probably was because player Adam James's father was an ESPN broadcaster maybe why it got the attention it did, and protected him, and maybe it wouldn't have happened. There's probably some other schools where the same type of activity might have occurred where some coach didn't like a player, thought maybe he was a malingerer because he had a concussion and didn't want to practice the next day, and at Texas Tech, the university has responded.

Is this the conduct that the NCAA wants to leave to each school to take care of, or should the NCAA react and control it on a systemwide basis?

Mr. KLOSSNER. I can't speculate on the alleged situation in Texas. Our position is to do what is in the best interests for our student athletes' well-being and continue to study the issue, as

we've done since 1976 and before. At the end of the day, you know, student wellbeing is paramount. We provide playing rules, we provide sports medicine handbook guidelines, we provide videos on appropriate practices for our members to utilize and to make the best decisions at the end of the day that they can at the local level.

From a proposed rules standpoint, we are making changes as far as putting it in the hands of the officials to remove student athletes who exhibit signs of concussions and that the individuals are then assessed by medical professionals, particularly, a physician, and even though that may be happening on some campuses, as you note, it may not be happening on all campuses. So we think that the proposal rule, one, highlights the prevalence and importance of concussion but also sends a signal that these individual student athletes need to be evaluated appropriately and have appropriate return-to-play standards in place.

Mr. COHEN. All right, my final question is kind of to Dr. Maroon and maybe Mr. Halstead on this helmet issue. You said your study is not going to be finished or released until March—or I think it was March. I would think it would be—if it's not complete, I understand that, but at that time—and will the NFL—is the NFL willing to share all prior communications and research regarding helmet safety, testing, and protocols.

Dr. MAROON. I, quite frankly, Congressman, I'm not sure what the NFL's intention is to do with the data. I'm aware that the testing was carried out at the request of the equipment managers to somehow bring—to obtain objective data so that the individuals relative to each team would have some better idea on how to obtain the specific helmets that might be most protective.

At the present time, we know that this—that up to 40 percent, for instance, of the athletes on the Pittsburgh Steelers team are wearing older model helmets that, in my opinion, could be upgraded, but for various reasons, they're not wearing the newer helmets, and I think that there needs to be some nudging in that regard. How the NFL proposes to do that and what data and how it's going to be released, I don't know.

Mr. COHEN. Mr. Halstead.

Mr. HALSTEAD. Yes. My understanding is that the data will be released in March. I'm not exactly sure how it will be used. It is my understanding that the intent is as Dr. Maroon opined, many football players are wearing much older technologies. The data thus far shows, that I've seen at least, it is still being analyzed by an independent analysis team, as I understand it, but the data does show that some new helmets do attenuate energy in those tests much better. Some, not so much. So I think it will be interesting data.

Again, I'm concerned about how it gets used. I think that the concept of players being able to make and equipment men being able to help them make better decisions because of how a helmet performs on this test is a possibility. I think that taking the data quite literally and saying well, this helmet performed 20 percent better than our old helmet, maybe it reduces the risk of injury 20 percent, that would be absolutely incorrect.

So I have some real concerns about how it's used, and we are talking about energies and accelerations to the head, and I've

heard a hundred g's mentioned by Dr. Omalu, and you know, I'm not a politician, and I don't understand, maybe, a lot of these debates, but Congressman Sánchez, you sneezed a while ago, and that was a head acceleration. I don't know that you're brain damaged, and I don't know that you'll be demented——

Ms. SÁNCHEZ. Others will argue with you about that.

Mr. HALSTEAD. Right, I don't know that you'll suffer dementia later, that really is the issue here is how, without being able to see into the brain, do you know that the impact's been one of a sufficient magnitude to cause the concern? I think that's why things have moved slowly, and I'm not defending anybody, I don't belong to any of these MTBI committees and don't know, but I do know from studying helmets for a long time somebody's got to give me the target, and that's somewhat related to the input energies.

And helmet manufacturers have looked at this testing and have said we can do better, so the NFL has extended to them an opportunity to submit additional helmets for testing. They may do better. But whether or not they, you know, actually work better in the field to reduce or limit concussions, I think remains to be seen, but I have a hard time arguing with a helmet that manages more energy than some other helmet.

Mr. COHEN. Thank you. And if either of the two helmet manufacturers' representatives want to comment, you don't have to, but if you wanted to, I'd like to give you the opportunity. Mr. Ferrara.

Mr. FERRARA. I feel it is important to take note of what Dr. Maroon, who I would consider a good ally, pointed out that it appears there's a stated corporate goal on the NFL's part to move players into modern helmets. A corporate goal is not a scientific study. The idea of creating an older helmet profile is highly unusual.

Some of the helmets were literally taken out of locker rooms, apparently. Some of them were taken off of the shelves. Given that helmets other than ours consist of multiple components with unknown histories, no date stamps, that get shuffled year after year in the reconditioning process, these helmets would be entirely unreproducible. It would be as if you walked out on the street right now and you grabbed a dozen people who appeared to be older, whatever that meant to you, and you took measures of their health and said this is the profile of an older person, we're now going to test younger people versus older people to see who's healthier. It simply doesn't make sense. It's not credible science.

Mr. COHEN. Thank you, sir.

Mr. HALSTEAD. May I give a response.

Mr. COHEN. Surely, go ahead, sir.

Mr. HALSTEAD. Yes. The old helmets consisted of Pro R 2s and VSR 4s, some of which I actually went and got off the field, and I have a pretty good idea of what they looked like, but Dr. Ferrara is correct, it's my assessment of what they look like.

However, we were able to get from Schutt Sports Manufacturing two 10-year-old Pro R 2 helmets that had been never been put into play, and we were able to get from Riddell at least two for each lab. The VSR 4 helmets had never been put into play. So we had a pretty good idea of those constructions. Whether they were hermitically sealed and somehow stored for all those years is another question, but we did have unused helmets, and we had used

helmets, and their performance on the test was statistically so close so as to render the argument that Dr. Ferrara just made kind of inert.

Mr. ARMENT. My comments would center around—I want to go back to my comments before where I said clearly, there is opportunities to improve helmets, and a brought range of research and debate and—is important to the topic. Our commitment at Riddell is to ensure that we continue to put the best technology on the field and that we use science and independent research to verify that those helmets are, indeed, as good as we say they are.

And that is our commitment, and I think that, you know, is evidenced by the history of our helmets and the peer reviewed research that we have, and that's a commitment that we're going to maintain and continue to follow through with all of our product development.

Mr. COHEN. Thank you. Doctor.

Dr. OMALU. Can I make a comment as a physician and also as a forensic pathologist. We've been talking about scientific evidence, scientific testing, but I must warn that medicine is not an absolute science. We cannot make absolute derivations from a laboratory simulation what happens in the human body. Findings like what they're talking about, statistical significance, if you change your end point, epidemiology is not an absolute science. There are multiple factors involved. The end point, the outcome, the cause will be different if you change your limits or if you change your study definition.

And as a physician, you cannot base the plight of the player on a single published paper or on a single study formula. Again, the guideline as a physician who's sworn to the Hippocratic Oath should be the players, themselves. The focus should be the players, and again, like the law recognizes, generally accepted principles and common knowledge should try and guide our decisions and the decision making in concussions, not laboratory simulations and corporate derivations. Medicine is not an absolute science like mathematics or physics.

The human body cannot be simply reduced to an index or just a number, and this is what the Hippocratic Oath is all about. We must always have that behind our minds while we're discussing these issues.

Mr. COHEN. Thank you, sir. One last issue on the helmet issue, the issue's been raised, I guess, by this testimony about the NFL's endorsement, long-term endorsement with Riddell. I guess it's the helmet of the NFL or something like that.

Mr. ARMENT. It's the official helmet of the NFL.

Mr. COHEN. Official. Does that create a conflict of interest, Mr. Halstead, for anybody when you get into helmet tests? I mean you got the helmet of the NFL, this is the helmet that protects the brains of the NFL players which, in essence, you know, some of these owners might not belive that they are the NFL, it's not the owners, they get a big share, it's like I won, and they didn't do anything, they just bought the team. It's the players who are the NFL. And so the helmet's protecting their brains. Shouldn't be there some reason to believe that maybe there shouldn't be an endorsement so there might not be some proclivity to favor one helmet

over another, whether it's Mr. Ferrara's or Mr. Arment's and just have the helmet?

Mr. HALSTEAD. Sure, I'll give you my personal opinion. I'm not a marketing person. When I see these things, I think of them as marketing decisions. Frankly, I—my personal experience, which is somewhat limited with the league, is I've had players and equipment managers and trainers and physicians call me and say I've got So-and-So's been injured, you know, what helmet should I put him in? And I don't have an answer for that because I don't have any data to support that any helmet's better than any other at preventing the next injury. The real issue is not hitting your head again, and that goes back to return-to-play guidelines and things that are beyond my ilk. Frankly——

Mr. COHEN. But you said your study shows that some helmets didn't do any good, and some did a lot of good, and some did a little bit of good, you got a number——

Mr. HALSTEAD. No, I think that's a mischaracterization. What I said is that in these impacts, the study did show that some newer helmets managed energy significantly better.

Mr. COHEN. Right.

Mr. HALSTEAD. And some did not, which is kind of surprising because the real difference between new helmets and old helmets is how much standoff there is and how much distance there is from the outside of the skull to the inside of the shell, and as helmets get larger, they're able to manage more energy. Whether that makes a better helmet for certain levels of play is very, very questionable.

To specifically answer your question, I think any kind of an indication or any emphasis that would have a player choose one product over another just because of the name that's on their product, probably not a good plan.

Mr. COHEN. Yeah, and I guess, you know, you pay the NFL, is that right.

Mr. ARMENT. We have a licensing agreement with the NFL.

Mr. COHEN. How much is that? How much does that generate a year.

Mr. ARMENT. Our licensing agreement generates—it's about a 15 percent royalty rate.

Mr. COHEN. And what's that come to in dollars.

Mr. ARMENT. It's off of our consumer products business, so historically, it's been, you know, less than a million dollars.

Mr. COHEN. Just, you know, I understand that it's good for you, and it would be good for Mr. Ferrara if he could be it, but it just seems like Delta being—or Planters being the peanut of Delta, or Coke being the beverage of Delta is different than the helmet. Nobody's going to get hurt too much with the peanuts and the Coke.

Mr. ARMENT. Yeah, you know, I would hope to come back to the fact that it is player choice and every manufacturer has complete access, the same access that Riddell has, and we have worked very, very hard with the NFL and with the NFLPA to educate the players on the differences between—and the features and benefits of our helmets.

I think the, you know, business relationship between the NFL and Riddell is completely separate from the on-field choices that

were made. If that wasn't the case, we would have a hundred percent, and we have an 80 percent number.

Mr. COHEN. I appreciate your testimony, I appreciate your product, and I thank the Chairman for his having the Committee and this outstanding panel he's put together, and I yield back the remainder of my time.

Mr. CONYERS. Thank you so much.

Mr. Hallenbeck, would you like to have the second to last word in this hearing before the panel?

Mr. HALLENBECK. Thank you, Chairman. I guess as I sit here, I look at it from the view of probably all your constituents, the mom, the dad, you know, worrying about our sons and daughters playing the sport, and what I said in my statement and testimony, which I think is absolutely critical in all of this, a lot of healthy debate, if you will, but in the end, if we don't come to a solution that is clear, concise, and simple application so that the moms and dads and the kids can understand it, we've all done something terribly wrong.

So I guess the important statement here is, you know, we need to make sure we can boil this down and people can understand it. It's my job then to get it out in the hands of these parents and players, and so forth. So I think there's clearly been some very positive action taking place in the last 3 months, and I know there's been work done before that in my own organization. We've been meeting with the American College of Sports Medicine and a lot of other groups to try to make some positive strides in this area, and—but certainly in the last 3 months, there's been a sea change, and so I credit all of the parties involved, including, certainly, this Committee, the NFL Player Association, and so forth, and it's been said already what happens at that level absolutely trickles down.

And so it's for my sole view of, you know, focused on youth football and amateur football, I just hope all of us focus on the fact that we've got to get to the point where we can offer some real credible, concise, clear protocols that we can get out and help these young players understand what the details are around this and ultimately how to return to play safely. Thank you very much.

Mr. CONYERS. You're welcome. And Bob Colgate, high school, you have the last word on this panel.

Mr. COLGATE. Thank you, Chairman Conyers. I'd have the same comments Mr. Hallenbeck brought forth. You know, I know we're talking about football, but from our perspective of writing the playing rules for 17 sports and dealing with 7.5 million young men and woman participating in high school sports across the country, concussions goes across all areas. And so we've got to look at it from that perspective.

We're very, very interested in the ongoing discussions that this committee has, also, the research, and also the equipment. It plays a part, not only in football, but in all of our sports. So any assistance that we can get to work with our 19,000 high schools across the country would be of benefit. Thank you.

Mr. CONYERS. You're more than welcome. I thank all the panelists. There are eight other witnesses, doctors, former players, trainers, Luther Campbell, and others. We will now take a short break

and eight other witnesses will resume, and I thank you for your patience.

[recess.]

Mr. CONYERS. We welcome our second and final panel, and I'd like to just make a point of order that the second panel is not inferior to the first panel. This is not some kind of ranking. It was just that we couldn't get all 18 of you all up on the same panel at the same time. We're happy to have Bernie Parrish, former Cleveland Browns pick and choice for many years; Luther Campbell, the much sought after professional trainer of athletes in the country who is particularly occupied in the Metro Detroit area and has trained athletes in both football, basketball, and boxing; George Martin who was 14 years with the New York Giants, we're delighted that he's with us; the founder of the Vince Lombardi Foundation, Robert Schmidt, and we're delighted that he is here; Kyle Turley spent 9 years with the New Orleans Saints, the St. Louis Rams, Kansas City Chiefs, an NFL All Pro; Chris Nowinski, best known as the Former World Wrestling Entertainment Professional Wrestler who turned his background as an all-ivy Harvard football player into one of the most prominent figures on television these days and nights; Dr. Jeffrey Kutcher, a hockey player since childhood, who developed an interest in sports neurology at the University of Michigan is with us, and our first presenter will be Dr. Randall Benson.

He's the only fellowship trained behavioral neurologist at the Detroit Medical Center. He's been on both DMC and Wayne State University since 2001, an active member of the teaching faculty, and has a very distinguished background in clinical and research in traumatic brain injury and now fully engaged in studying both impact and nonimpact head injuries, seeking to understand the biomechanical mechanisms, treatment, and prevention of injuries.

We're delighted that Linda Sánchez, who I hope you don't have to find out how difficult it was for her to get here today, in route, we deeply welcome her dedication for the work that all of us love, and Steve Cohen, from Memphis, Tennessee, is a valued friend of ours, as well, who's contribution is very significant.

I would invite all of you in this final part of our discussion to add any comments that you would feel ought to be in this very extensive record that will be reproduced and studied and examined by people from all professional walks, as well as from the sports industry, itself, to make comments about anything you may have heard in the—during the discussion of the first panel or anything that came up in the first panel that you would like to have a comment made about that.

This out of the way, I'd like to invite Dr. Randall Benson to begin our discussion. Welcome, sir.

TESTIMONY OF RANDALL R. BENSON, M.D., ASSISTANT PROFESSOR OF NEUROLOGY, WAYNE STATE UNIVERSITY

Dr. BENSON. Thank you very much, Chairman Conyers, Mr. Cohen, Ms. Sánchez. It's, indeed, a pleasure to have the opportunity to speak to you today on something that is so important. In fact, like most of us, I'm a lover of football. I moved to Pittsburgh in 1969, and left to go to St. Louis in '78. And so I was indoctri-

nated in the Steeler tradition, one might call it a religion almost, and I just had the pleasure of meeting Mike Richter's son, Garrett, out in the hall, and I asked him who he plays for, and he said he didn't play, and my jaw dropped, and then he explained to me that he had a knee injury, but I trust that his head is fine.

So I actually wear two distinctively different hats, and I'm going to speak to you from both perspectives. On the one hand, I—I treat TBI and have done so since 2001. On the other hand, I spent some time being nurtured in Boston first at Boston University where Chris Nowinski has ties, and then at Mass. General where I get into the imaging and also trained in behavioral neurology, and so I think it was only a matter of time before I came to head trauma; although, I came to it kind of in a backwards fashion, looking at stroke and working on something called functional MRI at Mass. General.

So since my arrival at Wayne State in 2001, my research emphasis has greatly shifted to the application of what one might call functional MRI methods to traumatic brain injury. This was in large part driven by cross-campus strengths in TBI at Wayne. Wayne State University, as has been mentioned, has a long and illustrious history of biomechanics, head trauma research beginning in the forties with Gurdjian and Lissner's studies using cadaver brains, which led to the Wayne State Concussion Tolerance Curve which continues to be the foundation for most currently accepted head injury indices.

Over the last three decades, Dr. Albert King has been leading the biomechanics and bioengineering department here at Wayne State and continues the tradition of excellent biomechanics research. In particular, he has developed some of the vast three-dimensional mathematical models of the brain's response to impact and blast forces which have resulted in improvements of automobile cabin safety and, also, football helmet design he's taken a look at.

I'd like to introduce Dr. King, who I must say I'm disappointed that he's not on the panel. Dr. King?

On the medical side, hospitals at the Detroit Medical Center are world leaders in the acute and rehabilitation stages of TBI respectively and have had continued NIH research support. My clinic is comprised largely of patients with brain disorders, the majority of which are dementia evaluations and traumatic brain injury cases. In a given week, I'll see as many as three to four new patients with TBI and an equal number of memory disorder cases.

What I'd like to do now is very quickly share some observations from my 8 years of evaluating TBI, and I think they're germane to sports related concussions, as well. Now, the vast majority of my TBI cases I will get neuropsychological testing and advanced MRI imaging or MNR imaging on. The first observation is that people with TBI are frequently misdiagnosed, often by multiple physicians.

The second is the most frequent diagnostic category given is psychiatric, anxiety, depression, conversion disorder.

Number three, two neuropsychologists studying the same patient may differ considerably regarding the existence of TBI, and I think

that's really important that neuropsychology is not an exact science.

Number four, TBI symptoms overlap considerably with those of primary psychiatric disorders, and some researchers believe that it's actually a continuum, that posttraumatic stress disorder may, indeed, be a very mild form of TBI.

Number five, without the ability to see the brain injury with imaging, there is no completely objective way to determine what is TBI and what is something else, for example, posttraumatic stress, conversion disorder, malingering.

Number six, people with brain injuries seem to vary considerably in severity of symptoms and in recovery in the face of similar falls, crashes, etcetera. This may speak to population differences in resistance to injury or effectiveness of neuro recovery mechanisms, and it's in agreement with Mickey Collins from the University of Pittsburgh who found large differences in recovery from single concussion, and this work was presented at the North American Brain Injury Society annual meeting just a few months ago in Texas.

Finally, advanced MR imaging techniques, I believe, including susceptibility weighted imaging, diffusion tensor imaging, and something called MR spectroscopy are able to reveal brain injuries where CT scans and conventional MRI appear normal. Sports related TBI or concussion is not different from sports related TBI, except that the severity is usually mild, but repetitive concussions are the rule in sports which have an increasingly poor prognosis.

So I'm involved in several ongoing research studies involving TBI which have in common the application of newer imaging methods but which differ by severity, time frame to imaging, funding status, specifics of scanning sequences, and mechanisms of injury. Each of these imaging studies is done at the MR research center at Wayne State University under the directorship of a Ph.D. Physicist, by the name of Mark Haacke. He's internationally recognized for his achievements in vascular susceptibility mapping which are very relevant to concussive brain injury.

For example, one study looks at acute, mild TBI or concussion. We scan these people right out of the emergency room. A second study looks at more severe TBI when medically stabilized. Another study has been going on for 15 years supported by NIH, but an imaging component was added to this. We have more recently studied former NFL players in two capacities, the first sponsored by the NFL is an imaging study using imaging methods prescribed by our group with imaging performed at a clinical imaging facility, ProHealth, in New York.

Images are then sent by CD Rom to us for analysis. To date, we've received and analyzed 41 scans sending reports back to Drs. Casson and Viano in New York. Of course, we know that this is on hold now. My role is as a consultant on both image quality and data analysis and reporting. This study projected to scan more than twice this number and, thus, is incomplete at this juncture. The second study is a pilot imaging study of former NFL players withstanding an analysis performed in Detroit. To date, we've enrolled eight subjects, and I'm going to present some very preliminary data on—on some of these former NFL players.

I'd like now to review some of the imaging methods we've developed and applied to TBI. The unabashed emphasis of our work is the image traumatic axonal injury, also known as diffuse axonal injury, which I'm sure this panel is aware of, this panel and the committee, which is responsible for the bulk of chronic cognitive deficit following TBI. In addition, the most devastating consequence of repetitive TBI, chronic traumatic encephalopathy, is thought to be the result of diffusion axonal injury, possibly caused by a series of concussions before full recovery occurs from the prior concussion, okay?

This weekend I had the opportunity to e-mail Dr. McKee repeatedly in preparation for my testimony, and she gave me the go ahead to quote her. Specifically, there's a hypothesis that she supports that phosphorylated tau, which we've heard something about, within damaged axons is toxic to these neurons, and in fact, Dr. Omalu mentions that amyloid—the precursor protein may be the catalyst for triggering the tau protein deposition, which is, as we understand, cytotoxic and may underlie CTE.

Electrophysiologic data from an EEG, known as the event related potentials, indicate that even after symptoms have abated from sports concussion, the brain has not normalized, and again, Dr. Omalu mentions 99 days, all right? So certainly, it raises the question of whether people should be returning to activity before that 3-month period. This suggests that clinical symptoms are not a reliable indicator of recovery and that to rely on symptoms exclusively to guide your turn is to put the athlete at risk.

Okay. So now I'd like to show you a movie. Actually, this is a movie that was—it was made from a series of MRI images, okay, with a volunteer moving his head back and forth inside the MRI. And if we could cycle that a few times, what I want the attendees to appreciate is that this is sub-injury threshold movement, and I think what you can appreciate—now the matrix was something that was superimposed over the brain—is a movement of the brain, itself, within the cranial cavity, all right?

And again, this is a person like you or me simply moving their head back and forth repeatedly. This work was done by Dr. Phil Bailey, who has his own neurotrauma lab at Washington University. I also have a similar image that was obtained by Dr. Van Wedeen at Mass. General Hospital and looks very, very similar. So again, the notion that you can sneeze and cause brain injury may be a little bit farfetched, but it's not farfetched to think that there is brain movement occurring with relatively moderate head movement.

Okay. Okay, next slide? Okay. So I don't know that you can—I don't know if we can turn the lights down, but I think that would maybe help with visualizing some of these images. So the first image type that I want to tell you about that we now have plenty of experience with is something called susceptibility weighted imaging.

In 2004, we had the opportunity to scan an 11-year-old boy whose vehicle skidded off a mountain while his parents were driving in the mountains of Colorado, and his parents both died in the crash, he survived. He came to us in a coma. His family was originally from Michigan, and we scanned him with these new tech-

niques, and what I'd like to point out—I don't know if you have a pointer, I'm not even sure it's necessary—the image on the left is a standard conventional MRI, a so-called T1 weighted MRI.

The image on the right is a susceptibility weighted image developed by Dr. Haacke, and what I want you to appreciate are the multiple black holes in that image. I trust that you can see those. And those are microhemorrhages. Those are an indicator of what we call diffuse axonal injury. He—he has gone on to come out of his coma. He is by no means normal, he's quite impaired, and—and I think the imaging, certainly the way we do it, gave us some indication of what his prognosis was.

Next? Okay. Another example, even more striking, I think, this is not a TBI case, this is a condition known as cerebral amyloid angiopathy. So it has that word "amyloid" in there, and there is a relationship. You tend to see this in older individuals, frequently with Alzheimer's disease, and again, appreciate the absence of holes in the standard clinical T1 image and the plethora of hemorrhages, and the pathologists, I believe they did biopsy her. The imaging was done postbiopsy. The pathologist told me that there was an excellent correlation between the imaging and the pathology.

Now, it's also true that individuals can have more mild injuries, as we know. This—this patient was involved in—in a motor vehicle accident. We scanned her 3 days post her accident. Her Glasgow Coma Score was 13, which is classified as mild, and again, you see the hemorrhages which are apparent in the frontal lobe on the SWICN but not the conventional image. Next?

Okay. Another mild case, this time, not diffuse axonal injury but a bruise or a contusion in her frontal lobe. This was an employee at Wayne State who slipped and fell and hit her head on an iron—an iron bar of some sort and went back to work but wasn't right, and eventually, she took an early retirement because cognitively, she never did recover back to her prior baseline. Next?

Okay. Now, we move on to really what I think is the most sensitive technique in looking at diffuse axonal injury, and this is called diffusion tensor imaging. Panel A shows you schematically what a normal axon looks like. B shows you changes that occur early after stretch trauma or other kind of deformation, and then C is the end stage. And the reason I'm showing you the change in shape is that this is what allows us to image and to identify axonal injury, all right? So C is the late stage. You see the so-called retraction ball? Okay.

What we did is we looked at 20 patients with trauma that came through our doors, and we looked at 14 normals, and we plotted the distribution of an index which I won't bore you with, it's called fractional anisotropy, or FA, and what we find is that there's clear separation between the trauma cases and the control cases, and furthermore, because of good correlation between the severity of the injury and what we find in the imaging, and we've gone on to refine this—can you back up one slide—and we now do a regional analysis. Well, we can now look at the injury in standard atlas defined regions rather than just looking at the global brain. Next?

Okay. And we also compared each individual brain to 50 normal brains, and we did a statistical analysis, and this allows us now to identify specific voxels, specific pixels, if you will, that are showing

an abnormality in this diffusion in these. Okay? So now, this puts it altogether. This is a comparison for a single subject on a single slice showing the SWI with microhemorrhages and BTI with axonal injury, and something called MR spectroscopy, which is a way to look at the biochemistry, and they're all showing us abnormalities in the lighting on it.

All right, in the first NFL case, we actually had the opportunity to scan both in New York and at Wayne State, and this allowed us, in a sense, to calibrate the imaging that was done in New York for the NFL, and what I want to show you is that there's striking similarity between the findings. The left column is the Wayne State image of the three select slices. The middle column was obtained in New York, and then the third column is the average of the two, all right? Clearly, this former NFL player has an axonal injury, I would say, based on my experience, that he does.

Next slide, and the last slide. Thank you for indulging me. This person is a 36-year-old, 11-year vet of the NFL, he's a fullback. He retired 3 years ago. Now, interestingly, I went back and looked at his questionnaire, he has by his report over 50 episodes of hits that rendered him blind for about a minute. He said that he needed help to get back to the huddle. He states he has no visual impairment now. The one area of abnormality he has in the area called the splenium of the corpus callosum, and that, of course, that contains crossing fibers from the two visual cortices of the brain.

And so what I would suggest and my opinion is that if we're going to get to the bottom of the issues, we need to do a large scale imaging study, not just imaging. We know about the individual variability. We need to look at ApoE. We need to look at many factors, but we need to do a cross-sectional study. We also then, possibly contemporaneously, need to look prospect—we need to follow NFL players throughout their career, charting concussions in order to identify the predictors of cognitive deficit and, in particular, CTE. Thank you for allowing me to testify.

[The statements of Dr. Benson follows:]

PREPARED STATEMENT OF RANDALL R. BENSON

Written Testimony

Randall R. Benson, M.D.

Assistant Professor of Neurology

Wayne State University School of Medicine

Co-Director, Memory Disorders Clinic for Detroit Medical Center

Co-Director, Traumatic Brain Injury Imaging Program, MR Research Program, Harper Hospital,

Detroit Medical Center

Hearing before the House Judiciary Committee

Legal Issues Relating to Football Head Injuries

January 4, 2010

Mr. Chairman and Members of the Committee:

Thank you for the invitation to testify today on *legal issues relating to football head injuries*. My name is Dr. Randall Benson. I am an assistant professor of Neurology at Wayne State University School of Medicine where I have a neurology clinic, teach students and residents and do research. I am also an attending neurologist at Detroit Receiving and Harper Hospitals ten weeks per year where I admit patients and consult on others. I am the sole fellowship trained behavioral neurologist in the practice so that my clinical, teaching and research are strongly focused on brain function and disorders of brain function.

I received my medical degree in 1987 and am board certified by the American Board of Neurology and Psychiatry. I did my neurology training at Boston University and then at the NMR-Center of Massachusetts General Hospital where I trained in functional neuroimaging and then pioneered the use of a new MRI technique, functional MRI, for mapping language areas in the brain. This technique, I am pleased to report, is now clinically reimbursed by health insurance companies. Following this work, my goal was to combine functional imaging with electromagnetic stimulation of brain to enhance neuroplasticity (neural reorganization underlying functional recovery) in injured brains. I applied this experimental treatment paradigm to stroke patients with language impairment and hand weakness, the latter study a Phase III multi-site, pivotal trial sponsored by Northstar Neurosciences (Seattle, WA).

Since my arrival at Wayne State in 2001 my research emphasis has gradually shifted to the application of "functional" MRI methods to traumatic brain injury. This was in large part driven by cross-campus strengths in TBI at Wayne. Wayne State University has a long and illustrious history of biomechanics head trauma research beginning in the 1940's with Gurdjian and

Lissner's studies utilizing cadaver brains which led to the Wayne State Concussion Tolerance Curve, which continues to be the foundation for most currently accepted head injury indices. Under Dr. Albert King's leadership for three decades, three dimensional mathematical models of the brain's response to impact and blast forces have resulted in improvements in automobile cabin safety and in football helmet design used in the NFL. On the medical side, hospitals at the Detroit Medical Center are world leaders in the acute and rehabilitation stages of TBI, respectively, and have had continued NIH research support. My clinic is comprised largely of patients with brain disorders, the majority of which are dementia evaluations and traumatic brain injury cases. In a given week I will see as many as 3-4 new patients with TBI and an equal number of memory disorder cases.

I would like share with you some observations from eight years of evaluating traumatic brain injury cases, the vast majority of which I obtain neuropsychological testing and advanced MR imaging: 1) people with TBI are frequently misdiagnosed, often by multiple physicians; 2) the most frequent diagnostic category given is psychiatric—anxiety, depression, conversion disorder; 3) two neuropsychologists studying the same patient may differ considerably regarding existence of TBI; 4) TBI symptoms overlap considerably with those of "primary" psychiatric disorders; 5) without the ability to "see" the brain injury with imaging, there is no completely objective way to determine what is TBI and what is something else, e.g., posttraumatic stress, conversion, malingering; 6) people with brain injury seem to vary considerably in severity of symptoms and recovery in the face of similar falls, crashes, etc. This may speak to population differences in resistance to injury or effectiveness of neural recovery mechanisms and is in agreement with Collins, et al. who found large differences in recovery from single concussion (North American Brain Injury Society Annual Meeting, 2009); 7) advanced MR imaging techniques, including susceptibility-weighted (SWI), diffusion tensor (DTI) and MR spectroscopy (MRSI) are able to reveal brain injuries where CT scans and conventional MRI appear normal.

Sports-related TBI or concussion is not different from non sports-related TBI except that severity is usually mild, but repetitive concussions are the rule in sports which have an increasingly poorer prognosis.

I am involved in several ongoing research studies involving traumatic brain injury, which have in common the application of newer imaging methods but which differ by severity, time frame to imaging, funding status, specifics of scanning sequences and mechanism of injury. Each of these imaging studies is done at the MR Research Center at Wayne State University under the directorship of Mark Haacke, Ph.D., an MR physicist internationally recognized for his achievements in vascular and susceptibility mapping. For example, one study looks at acute mild TBI or concussion while in the ER, a second looks at more severe TBI when medically stabilized, another study has been ongoing for 15 years supported by NIH but has a new imaging component. We have, more recently, studied former NFL players in two capacities. The first, sponsored by the NFL, is an imaging study using imaging methods proscribed by our group with imaging performed at a clinical imaging facility (ProHealth) in New York. Images are then sent by CD-ROM to us for analysis. To date we have received and analyzed 41 scans, sending reports back to Drs. Casson and Viano in New York. My role is as a consultant on both image quality and data analysis and reporting. This study projected to scan more than twice this number and thus is incomplete at this juncture. The second study is a pilot imaging study of former NFL players with scanning and analysis performed in Detroit. To date, we have enrolled eight subjects.

I would like to now review some of the imaging methods we have developed and applied to TBI. The unabashed emphasis of our work is to image traumatic axonal injury (TAI) also known as diffuse axonal injury (DAI) which is responsible for the bulk of the chronic cognitive deficit following TBI. In addition, the most devastating consequence of repetitive TBI, chronic

traumatic encephalopathy (CTE) (McKee, et al. 2008) is thought to be the result of diffuse axonal injury, possibly caused by a series of concussions before full recovery occurs from the prior concussion (Dr. Ann McKee, personal communication). This hypothesis is supported by the existence of phosphorylated Tau protein within damaged axons which is known to be toxic to neurons. Electrophysiologic data from event related potentials (ERP) (Broglio, et al. 2009) indicate that even after symptoms have abated from sports concussion, the brain has not normalized. This suggests that clinical symptoms are not a reliable indicator of recovery and that to rely on symptoms exclusively to guide return to sport is to put the athlete at risk for permanent neurologic impairment. In summary, head injury including mild TBI causes varying amounts of axonal injury which a) recovers slower than clinical symptoms; b) underlies the more important and longstanding functional impairments; c) gives rise to phosphorylated Tau in damaged axons and d) likely leads to CTE with repetitive concussions (possibly in genetically predisposed individuals (Teasdale, Lancet, 1997).

Most of our work has used victims of transportation related injuries and falls, however our principle research focus has always been closed head injury, under which concussion falls and is otherwise known as mild head injury. I will also include some examples of former players scans. The focus of my testimony will be susceptibility-weighted imaging (SWI) and diffusion tensor imaging (DTI). An equally important imaging method for addressing concussion is MR Spectroscopic Imaging (MRSI) a technique which is measures metabolic and biochemical processes. We (WSU) have been collaborating on TBI research with Loma Linda University School of Medicine (Drs. B. Holshouser and K. Tong) who have demonstrated the sensitivity and predictive ability of MRSI in TBI. Space and time prevent me from saying more on MRSI but an imaging study of concussion on current and former NFL players should contain SWI, DTI and MRSI at minimum.

Susceptibility-Weighted Imaging (SWI)

Imaging research of TBI began at WSU in 2004 when an eleven year old boy (C.G.) survived after his family's ATV skidded off a mountain road in Colorado plunging 200 ft. He was still in coma two months later when we scanned him at WSU. His CT and standard MRI revealed a skull fracture and atrophy but not much more. **Figure 1** compares a standard, clinically available T1-weighted image with a *susceptibility-weighted image* (SWI) through the temporal lobes and brainstem for C.G. sixty days after injury. Note the many "black holes" present in the SWI image which are small ("micro") hemorrhages indicating severe diffuse axonal injury (DAI) from TBI.

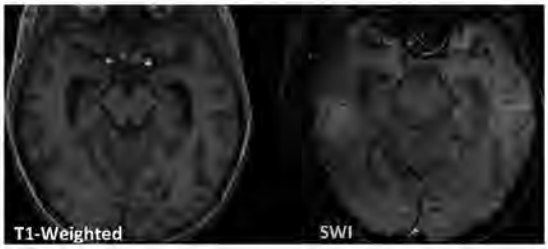


Figure 1. Comparison of T1 and SWI images for C.G. Note the many dark "holes" in the SWI image that are not present on the T1 weighted image. These "black holes" are caused by signal loss induced by paramagnetic hemoglobin or other iron containing blood products.

Developed by Mark Haacke, SWI is extremely sensitive to iron and blood products and detects microhemorrhages where conventional MRI fails. SWI detects hemorrhage at all stages, since iron remains even after the fluid from blood is reabsorbed. Prior work by Dr. Haacke with Loma Linda University (Karen Tong, M.D.) had demonstrated the value of SWI for detecting DAI in children with "shaken baby syndrome" where it was five times more sensitive than gradient echo imaging. In a series of 20 TBI patients (transportation related and falls) varying in severity and elapsed time since injury, we found an excellent correlation (P=0.54) between total hemorrhage volume and the number of days in post-traumatic amnesia which is known to be a good

predictor of one-year neurological outcome (*JMRI, 2009*). We have, since 2004, scanned over 100 TBI patients with SWI at WSU alone and a similar number at Loma Linda. In addition to TBI, it is being used in stroke, cerebral amyloid angiopathy (CAA) (**Figure 2**), Alzheimer's disease and disorders of iron metabolism. SWI is now clinically available on GE and Siemens MRI scanners.

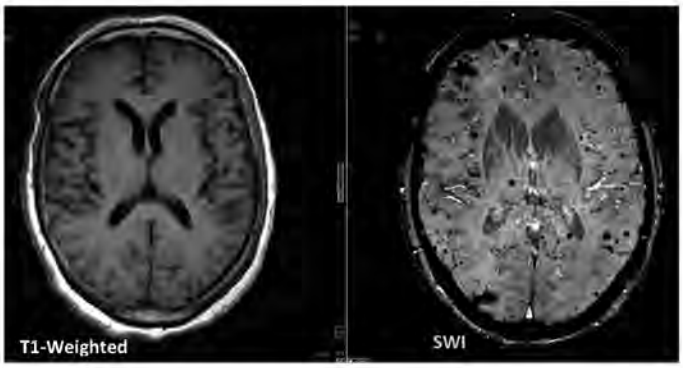


Figure 2. Comparison of T1-weighted and SWI images for cerebral amyloid angiopathy, another disorder involving multiple small brain hemorrhages in the elderly.

In our experience with **mild TBI/concussion**, hemorrhaging within the brain substance is more often caused by the direct blow (contusion) than diffuse axonal injury. More severe blows *will* cause microhemorrhages from diffuse axonal injury, which is the result of nonelastic deformation of brain white matter and vessels (shear injury) (**see Figure 3**).

Figure 3. 41 year old female (N.D.) scanned eight days after motor vehicle accident with LOC and 3 days of post-traumatic amnesia (GCS=13). Red arrows indicate microhemorrhages revealed in the SWI image but not the conventional T2 image or the other standard clinical images.

Figure 4 is an example of a cortical contusion in a 63 year-old woman with persistent mild cognitive impairment following a fall.

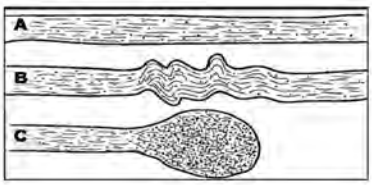
Figure 4. Only SWI clearly reveals a superficial hemorrhage in the left frontal lobe in a 63 year-old woman who tripped and hit her head on an iron bar. No loss of consciousness but mild confusion and persistent mild cognitive deficit.

In summary, SWI reveals large and small hemorrhages occurring as a consequence of trauma and detects acute as well as chronic hemorrhage, although systematic study of the evolution of hemorrhage in SWI has not been performed to date. In addition, measurement of total brain hemorrhage on SWI images using automated methods is predictive of neurological outcome at one year post injury. The hemorrhages, it should be noted, probably do not, in and of themselves, cause neurological impairment but are a marker of significant diffuse axonal injury.

Diffusion Tensor Imaging

Developed in the mid-1990's, diffusion tensor imaging (DTI) is sensitive to the 3D flow of water inside and outside of white matter fibers (the long extensions from nerve cell bodies which connect nearby or distant cells). Closed head injuries (non-penetrating) including concussion are caused by sudden acceleration or deceleration of the head which causes local deformations of the brain within the cranium. The anatomical and biomechanical properties of the brain are such that white matter fibers are stretched and damaged, resulting in diffuse axonal injury (DAI) which is the hallmark pathology and accounts for most of the neurological disability in TBI. The typical cognitive deficits in TBI, i.e., slowed information processing, decreased attention and memory, and psychiatric symptoms are caused by damage to the "cables" which allow for efficient transmission of information between neurons. TBI reduces brain network efficiency resulting in decreased capacity and global functional impairment. Concussive injury such as occurs in football with high speed collisions also causes deformation of brain substance and is felt to account for many of the immediate and delayed symptoms including the post-concussive syndrome. ERP studies of sports related concussion suggest that symptomatic recovery may occur while neurologic and brain metabolic functioning continues to be impaired from weeks to months after injury. Incurring a second concussion before neurologic recovery has been shown to worsen outcome and may begin a downward spiral culminating in chronic traumatic encephalopathy (CTE) but this is not known. Diffusion tensor imaging (DTI) is able to detect damaged white matter fibers (axons) which have altered flow of water molecules compared with healthy axons (**see Figure 5**). DTI, like SWI can be performed on a standard clinical scanner (1.5-3 Tesla) and is available on virtually all clinical scanners.

Figure 5. Schematic of healthy and injured axons. A. depicts an uninjured axon which is long and thin; B. Early after injury fiber becomes shows undulations; C. Late stage of degeneration "retraction bulbs" are seen scattered throughout the white matter. Water flow is altered as fiber geometry is changes and is detectable with DTI.



Our initial investigation of DTI in 20 TBI cases found that (similar to SWI and hemorrhage) an index of DTI, fractional anisotropy (FA), is decreased uniformly in TBI compared with 14 controls (**see Figure 6**), and that the magnitude of the decrease in average FA for global white matter is highly correlated with TBI severity (**Figure 7**). Even the 6 mild TBI cases (GCS 13-15) had decreased FA compared with the controls. The separation of the milds from the controls is especially relevant to sports concussions where the great majority of injuries are mild. **Figure 6a** shows the non-overlapping FA distributions between the TBI and control subjects.

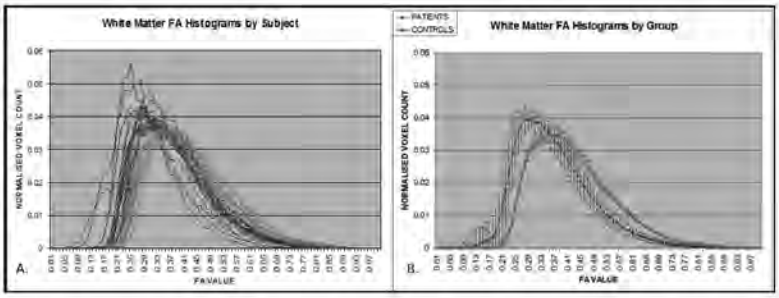


Figure 6. Comparison between 20 TBI cases (blue) and 14 healthy controls (red) on distribution of FA (0-1). **A.** All subjects' FA distributions given; **B.** Group average distributions shown with standard error of the mean plotted for error bars. Note the leftward shift, higher peak and greater variance for the TBI cases compared with the control group.

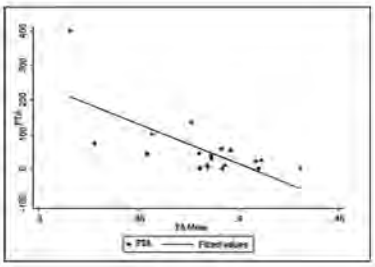


Figure 7. Plot of mean FA and length of post-traumatic amnesia for 20 TBI cases. Each dot represents a single case. Note that lower FA values are associated with longer period of post-traumatic amnesia during which patients cannot learn new information. Correlation is (-) 0.64 (Spearman).

To increase the sensitivity of DTI to axonal injury in mild TBI we have employed two regional analysis methods. Both of these methods require "normalizing" the images into a standard brain space and then comparing regional FA values of a single TBI patient *statistically* with those of 50 healthy control subjects taking into account normal variation. The first of these methods, ("regional" analysis), divides the total white matter into atlas-defined white matter regions (**see Figure 8**), while the second method ("voxel-based" analysis) compares the FA value of each voxel location (i.e., three-dimensional pixel) with the corresponding voxel from the 50 controls and displays abnormally low FA voxels in color (**see Figure 9**).

Mr. CONYERS. Thank you very much, Dr. Benson.

Dr. Jeffrey Kutcher comes from a bit different point of view, a hockey player since childhood, but at the same developed an interest in sports neurology at the University of Michigan and then served his neurology residency after graduating from Tulane Medical School. Since then, he's been on the University of Michigan staff as director of Michigan NeuroSport, an academic and clinical program focused on improving the neurological care of athletes. His

interests focus on sports injury and the management of neurological diseases in the athlete. Particular areas of research include concussion, migraine headache, and sleep disorders.

We welcome you and await your testimony, Dr. Kutcher.

TESTIMONY OF JEFFREY KUTCHER, M.D., DIRECTOR, MICHIGAN NEUROSPORT

Dr. KUTCHER. Thank you, Chairman Conyers, Congressman Cohen, Congresswoman Sánchez, thank you for giving me the opportunity to speak today. As you mentioned, I'm a neurologist at the University of Michigan where I am both Chief of Inpatient Neurological Services, as well as the Director of Michigan NeuroSport. You mentioned it is a comprehensive academic program of sports neurology. We care for athletes of all levels from youth sports to professional leagues. We conduct research on concussion, provide education to healthcare providers and the community about concussion, as well.

I'm also the team neurologist for the University of Michigan, Eastern Michigan University athletic programs, and through these roles, I conduct preseason baseline testing, diagnose and manage concussion on the sidelines, and follow patients after concussion in the training rooms and in my clinic. I'm also honored to be the Chair of the American Academy of Neurology's Section on Sports Neurology, which was founded in 2009 with the express purpose of improving neurological care of athletes at all levels, through education, advocacy, and research.

I should also note that I recently accepted an invitation from the National Football League to serve on their concussion committee as it's being reformed. I look forward to working with the group to help ensure the safety of the sport.

With that in mind, however, I'm encouraged that today's hearing goes beyond the scope of the NFL. While professional contact sport athletes may have a longer period of exposure, they represent only a small fraction of those at risk. With my time, I'd like to address three particular points.

First, concussion is a complicated injury. We've heard some testimony today to that effect. The brain is complicated in dynamic. We know from other brain disorders that there is a tremendous amount of variability between individuals. When a mechanical force is applied, we do not expect one brain to react the same as another.

To understand the short-term and long-term effects of concussion, we must first understand how concussion varies between individuals, what risk factors lead to worse outcomes, and how much risk can be attributed to genetic versus environmental factors. To accomplish this, I urge researchers to focus on these specific questions and more importantly, funding agencies to help provide the support needed to find the answers.

My second point is that because of the brain's complexity and the degree of individual variation, concussion management does not lend itself well to the use of protocols, clinical protocols. It is an injury that is best managed on a case-by-case basis by people with neurological expertise and experience treating athletes.

Such a large portion of concussion management involves determining when an athlete is back to their neurological baseline, it is extremely helpful if the physician has personal preinjury knowledge of that athlete, including their cognitive abilities and personality. This makes the team physician and athletic training staff a central component of any comprehensive concussion program.

At both the University of Michigan and Eastern Michigan Universities, we use our own surveillance data to determine which sports to enroll in our concussion-monitoring programs. Sports like football, wrestling, and ice hockey are some obvious choices, but we have also found the need to include many other sports at our schools, including water polo, field hockey, cheerleading, and diving, among others.

When each athlete enters our program as a new student athlete, we take a careful concussion history, we want to know what happened to them in the past before they came to us, as well as a detailed review of other diagnoses or family history that may be relevant to their concussion risk, such as dementing illnesses and headache disorders. We consider the acquisition of preinjury baseline data to be essential in conducting an evaluation that includes a neurological examination, neurocognitive testing, and a sideline concussion assessment tool in the preseason.

When a concussion is suspected, the student athlete undergoes an immediate clinical evaluation by the onsite certified athletic trainer and/or the team physician if they are present. The team physician then follows the patient closely until that concussion has resolved. Return-to-play decisions are not entertained until the student athlete is completely free of symptoms, has a normal examination, and has progressed through a graded exercise challenge program that we use.

Computerized neurocognitive testing is used as an extension of our physical examination, rather than a decision tool unto itself. Return-to-play decisions, as well as retirement decisions, are made with careful consideration of each athlete's history, as well as looking for certain red flags, a few of which are any change in their baseline function that we can tell on objective testing or through school work or more personal stories from their family members, escalating severity of symptoms in subsequent injuries, or if they're getting concussions too easily. We very carefully take a history of what caused each concussion, so we know what their threshold is, in other words.

However, with little published clinical data to help make these decisions, there is very little that we can point to and say this is when it's safe to go back. The key to making these programs work is the involvement of an experienced and knowledgeable medical staff. Relying on protocols is, in my opinion, potentially dangerous, clinical protocols, as they assume that conclussions are similar enough to each other to fit a predetermined paradigm.

The final point I'll make is that realizing that proper concussion management requires resources that are not available to the vast majority of high schools in the country and many colleges, we must address a larger public health need. To that end, the American Academy of Neurology has recently undergone a process of creating new practice perimeter guidelines. Dr. Casson in the first half was

talking about the '97 American Academy Guidelines with the one-two-three business, that is being revisited and we'll be coming up with new guidelines, we started that process a couple of months ago.

To accomplish that, we have assembled a panel of experts from the fields of neurology, neurosurgery, sports medicine, athletic training, emergency medicine, rehabilitation medicine and neuropsychology, being careful to choose members who are without a commercial conflict of interest. The sports neurology section of the academy is promoting awareness of concussion among primary caregivers and general neurologists, working to increase the number of neurologists specializing in sports neurology and developing the educational tools necessary to provide optimal care. We also feel that a central component of athlete safety is to increase the number of certified athletic trainers that are at all contact sport competitions and practices.

As evidenced by this hearing today, the management of concussion is evolving, and I'm glad to see that it is. I'm also honored to be part of the effort, grateful to be working with colleagues of such talent and focus, and I'm confident that together as a group, we'll be able to do what's best for athletes at all levels. Thank you.

[The prepared statement of Dr. Kutcher follows:]

PREPARED STATEMENT OF JEFFREY KUTCHER

Testimony of:

Jeffrey Kutcher, MD

University of Michigan, Department of Neurology
Director, Michigan NeuroSport

Chair, Section on Sports Neurology
American Academy of Neurology

Before the United States House of Representatives
Committee on the Judiciary

Field Hearing:
"Legal Issues Relating to Football Head Injuries, Part II"

January 4th, 2010
Detroit, MI

Chairman Conyers, members of the committee, and other distinguished guests, it is my honor to join you today and I am extremely grateful for the opportunity to testify as part of this hearing.

My name is Jeff Kutcher. I am a neurologist at the University of Michigan where I serve as chief of inpatient neurological services as well as director of Michigan NeuroSport, a comprehensive academic program in sports neurology. NeuroSport cares for athletes at all levels, from youth sports to professional leagues, conducts research on sports concussion as well as other issues in sports neurology, and provides education to athletes, parents, coaches, schools, and health care providers.

I am the team neurologist for the University of Michigan and Eastern Michigan University athletic programs as well as a neurological consultant for several local area high schools and the USA Hockey Developmental Program. Through these roles, I conduct pre-season baseline concussion testing, diagnose and manage concussion on the sidelines, and follow patients after concussion in the training rooms and in my clinic. As a practicing general neurologist, I also have experience with the complete spectrum of neurological disease, including stroke, epilepsy, headache disorders, and dementia.

I am also a member of the American Academy of Neurology, being chair of that organization's section on Sports Neurology. The Sports Neurology section of the American Academy of Neurology was established in 2009 with the expressed purpose of improving the neurological care of athletes at all levels through education, advocacy, and research. Finally, I should also note that I recently accepted an invitation from Dr. Elliot Pellman to serve as a member of the

National Football League's concussion committee. I am looking forward to working with Dr. Pellman and the committee to help ensure the safety of the sport.

With that in mind, I am encouraged that today's hearing goes beyond the scope of the NFL. While professional contact sport athletes may have a longer period of lifetime exposure, they represent only a small fraction of those at risk. Only by considering the effects of concussion across an athlete's entire lifespan can we begin to fully understand this injury.

Sports Concussion: A simple cause, a complicated injury

It is not uncommon in the field of neurology to come up against a diagnosis with an unknown cause. In contrast, sports concussion, at first glance, has a very clear cause, a mechanical force delivered to the brain as the result of a collision during play. Over twenty years ago, with this simple model in mind, the field of sports concussion management began trying to delineate concussion risk by establishing a clinically relevant way to classify each concussive injury. Despite excellent work by many individuals, we have yet to establish a system to classify concussion that has proven to be clinically useful. Current international consensus, as defined by the Zurich consensus statement from 2008, is that concussive injuries should not be classified at all.

Our failure to identify a clinically useful classification system for concussion is an indication that this injury is much more complicated than initially thought and, while the proximal cause may be

straight forward, it is what happens to each brain after the hit that is more important clinically. A more prudent approach, in my opinion, is to move on from attempting to classify concussion at the level of the injury itself, to broaden the scope and work to better understand concussion at the level of the individual.

We know from our knowledge of the brain and other brain disorders that there is a tremendous amount of variability between individuals. It follows, then, that when a mechanical force is applied, we should not expect one brain to react the same as another. To understand the short-term, as well as the long-term, sequelae of single or multiple concussive injuries, we must first understand how concussion varies between individuals. We need to better understand what risk factors lead to worse outcomes and how much risk can be attributed to genetic versus environmental factors. To this end, I urge researchers to focus on these specific questions and funding agencies to provide the support needed to find the answers.

Concussion management: a public health concern

Because the brain is a highly complex, individualized, and dynamic organ, concussion management does not lend itself well to the use of protocols. It is, rather, an injury that is best managed by people with neurological expertise and experience treating athletes. Unfortunately, the vast majority of athletes who sustain a concussion do not have access to concussion experts. Add to this the fact that approximately half of all high school athletes in this country do not have access to certified athletic trainers or any other medical specialist on site, and the problem

deepens. Because of these shortages, sports concussion is a public health issue that could use protocols that can be followed by our country's network of primary care providers, as well as more simple guidelines that can be followed by parents, coaches, friends, and teammates. Therein lies the rub, sports concussion is an injury that is hard to fit into protocols, yet has a natural need for them.

Concussion Management at the University of Michigan and Eastern Michigan University Athletic Programs

As one example of how to practically approach this dilemma, allow me to quickly highlight the concussion programs at the University of Michigan and Eastern Michigan University. Given the state of concussion science and the rate with which new information is published, we consider our management programs to be under constant review and modify them when appropriate. We consider the acquisition of baseline objective data to be a necessary component. We conduct a pre-season baseline evaluation for all at risk athletes that includes neuropsychological testing, screening neurological examination, and a sideline assessment tool. We understand the limitations of computerized neuropsychological testing and take great care to use it appropriately. Concussions occur in many sports, so we use our own injury surveillance data to help determine which sports to include in baseline testing, going beyond the obvious contact sports such as football and ice hockey to include less obvious ones such as water polo, field hockey, and diving.

When a concern for concussion arises, the student athlete undergoes an immediate clinical evaluation by the on site certified athletic trainer and/or team physician when present. A return-to-play decision is based on the initial evaluation and subsequent follow-up assessments with a team physician, and is not entertained until the student athlete is completely free of symptoms, has a completely normal examination, and has successfully progressed through graded exercise challenges without a return of symptoms. Computerized neuropsychological testing is considered to be an extension of our physical examination and not a decision tool unto itself. Return-to-play decisions, as well as retirement decisions, are, furthermore, made by careful consideration of each athlete's history. We fully realize that there is very little published data to help guide these decisions. The key to making these programs work is the direct involvement of an experienced and knowledgeable medical staff.

The American Academy of Neurology

Realizing that this approach requires resources that are not available to the vast majority of athletic programs at the high school level and even many at the college level, we must address the need to have scientifically valid guidelines for the masses. The American Academy of Neurology has recently begun the process of creating new practice parameter guidelines to help health care providers of all types manage their patients with sports concussion. This scientific process will include a rigorous and critical review of all published data on the topic. We have assembled a multidisciplinary panel of concussion experts from the fields of neurology, neurosurgery, sports medicine, athletic training, emergency medicine, rehabilitation medicine,

and neuropsychology. The goal of this panel is to create a document that is widely accepted, scientifically valid, and clinically useful.

In the interim, I would like to highlight two general rules that I feel should apply to all athletes:

- Any athlete that is suspected to have suffered a concussion should be removed from participation until he or she is evaluated by a physician.

- No athlete should be allowed to participate in sports if they are still experiencing symptoms from a concussion.

The American Academy of Neurology is also partnering with other medical and athletic organizations to help disseminate basic concussion knowledge to the individuals who need it most, the athletes, their families, coaches, schools and caregivers. The Sports Neurology section of the academy acts as a common ground, bringing together the fields of sports medicine and neurology and fostering a cooperative approach to sports concussion in order to effect change on a public health level. As chair of the section, I have three particular goals:

- To increase the awareness of sports concussion issues among primary caregivers and general neurologists.

- To provide both groups with the education and tools needed to provide optimal care.

- To help ensure the safety of our high school and junior high school athletes by insisting on the presence of a certified athletic trainer at all contact and collision competitions and practices.

As evidenced by this hearing today, the management of sports concussion is evolving. I am honored to be a part of this effort, and grateful to be working with colleagues of such talent and focus. I am confident that, together, we will do what is best for athletes at all levels.

Mr. CONYERS. Thank you, Dr. Kutcher.

Well, most people have seen Chris Nowinski, former world wrestling professional, entertainment, came out of Harvard playing football, and has been doing a lot of television work during his ca-

reer. Then he came into this state of his health diagnosed with postconcussion syndrome, and along with Dr. Robert Cantu, has put together the Sports Legacy Institute, and what I think is amazing about him is that his relentless effort to get into the sports concussion crisis has uncovered and changed the way concussions are treated in sports.

These a pretty big order for a person who stakes no claim on medical background or expertise, but he began looking at the deaths of Chris Benoit, Andre Waters, and so some of that investigation to end up—ended up on HBO, Bryant Gumbel, SBN, CBC, The New York Times, Boston Globe, National Public Radio, and we're interested in hearing about that journey. Chris Nowinski, welcome to our panel this evening.

TESTIMONY OF CHRISTOPHER NOWINSKI, CO-DIRECTOR FOR THE CENTER FOR THE STUDY OF TRAUMATIC ENCEPHALOPATHY, BOSTON UNIVERSITY SCHOOL OF MEDICINE, PRESIDENT AND CEO, SPORTS LEGACY INSTITUTE

Mr. NOWINSKI. Thank you, Chairman Conyers, thank you for that very kind introduction. And thank you, Members of the Committee, for having me again to testify as part of the second hearing on brain trauma in football. I'm not going to go into my personal history like I did last time, I'm going to focus on moving forward, but I'd like to say first it's also an honor to be sitting on a panel with Kyle Turley, who's 1 of the over 250 athletes who have pledged to donate his brain to our Center for the Study of Traumatic Encephalopathy at Boston University School of Medicine, and to be studied throughout his life and will be coming to Boston to be scanned this month.

It's also an honor to testify in Detroit where former Detroit Lions star and Hall of Famer, Lou Creekmur, played. Dr. Ann McKee recently diagnosed him with CTF after he died while suffering from dementia, one of the first victim who actually played definitively prior to the steroid era. I will not repeat the substance of my prior testimony, but I will reiterate that it focused on two major battles in what is appropriately described as a two-front concussion crisis.

Football is plagued by a problem with concussions and also a problem with chronic traumatic encephalopathy, which we've discussed, a disease caused by both concussions and subconcussion injuries. The disease has been known for nearly a hundred years. It was termed traumatic encephalopathy by Parker in 1934, and then the term chronic genetic encephalopathy was first used by Miller in 1966, and has been widely used by researchers since.

The problem with concussions in football is that there are too many. They need to be better prevented, reported, diagnosed, and managed. The problem with CTE in football is that our research at the center has yet to find a brain of a deceased athlete who played football in college or beyond that doesn't show signs of the disease. This becomes more and more shocking with each additional case.

Unfortunately, we cannot predict with any accuracy the risk to athletes who only played football through high school, but there is evidence to suggest the brain damage may begin at the youth level. Fortunately, the solution to both problems appears to be virtually

the same, fewer impacts to the head reduce total brain trauma, fewer concussions, and better diagnosis and treatment from concussions.

In October, the top problems were that truthful information on the risks of CTE and the magnitude of the problem, as well as meaningful information on how to reduce risks was not reaching these athletes, coaches, or parents. The National Football League by refusing to acknowledge the clear link between CTE and brain trauma was allowing this public health crisis to flourish.

I'm amazed and delighted to see how much it changed in the last few months. The combination of the Congressional hearings, promoting research, and a changing culture appears to have motivated the NFL to now arguably set the standard on concussion-bearing research, along with finally acknowledging the link between brain trauma and CTE.

Among the changes that have been announced since the previous hearing, the NFL, with input from the NFLPAs, changed the leadership of the committee and influenced change in youth education through public service announcements that have been approved by the CDC and also coach training. There have also been significant changes on the CTE research front. The National Football League Players Association has continued to strong push to address this issue in all levels by officially collaborating with our center at BU, and they will encourage actively retired players to participate in the center's research.

The NFL has also announced it will take an active role in our independent research, recently announcing that they will encourage athletes and retired players like Kyle to participate in our brain donation program and clinical research. In addition, the NFL has pledged to support the center's research financially with at least a million-dollar donation. Our research team must always have complete independence from outside interests to maintain the integrity of the scientific vigor of the research. In early conversations with the NFL, they have expressed their willingness to support us in a way that will maintain our independence. We look forward at the NFL and Boston University Leadership ironing out these important issues in weeks to come.

The changes the NFL's made since October launched a dramatic step forward in addressing this crisis. The researchers and advocates can spend more time addressing the actual problem of concussions and CTE rather than the prior focus on changing the minds of the football leadership. It's time focus on what needs to be accomplished going forward.

In a perfect world, athletes do not suffer unnecessary concussions, do not suffer too many concussions, the concussions are actually reported, properly diagnosed, and properly managed. In a perfect world, sports evolve to reduce total brain trauma, (including those milder, repetitive subconcussive hits to the head) to a tolerable level, whatever that may be, so that athletes do not eventually develop CTE due to recreational sports.

Reaching this perfect world has always required a culture change, and a culture change in football has always required a change in attitudes of NFL players. NFL players are role models and heros to younger football players. Because of the educational

efforts of outsiders and the change of incentives in the NFL, we've seen that attitude change happen virtually overnight. I was overjoyed to hear Kurt Warner, the quarterback for the Arizona Cardinals after a concussion say in December he was tempted to lie about his concussion symptoms to the staff, but, "I had to go what are you thinking, this is bigger than that."

The culture change will almost certainly trickle down to youth sports, especially at the high school level, where athletes are mature enough to understand the risks but less able to incorporate that understanding into behaviors. We must always remember that 95 percent of football players are under the age of 18 and under the age of consent, and so it is our responsibility to not let them throw away their futures with our endorsement.

At the first hearing on this issue, I entered into the record the Sports Legacy Institute's 10-point plan to save football. It provides a strong framework to assess our progress in addressing the options available to us to make sports saver. Using the framework, if I could snap my fingers and make changes prior to the 2010 season, I would change the following:

First, education for coaches. We, the Sports Legacy Institute, gives live presentations about an hour and a half long, but we can't be everywhere. The CDC informed me last week that they are in the process of developing a simple 20-minute certification course using their widely accepted Heads-Up program that they hope will be ready in 6 months. When it's up and running, I would make an online concussion certification program mandatory for all coaches similar to CORI checks. That should be done voluntarily by leaders of these sports organizations, or if they drag their feet, it can also be done legislatively state by state like was done in Washington.

I also plan to make sure parents know this program is available and to ask them the following question: "Is a coach that refuses to invest 20 minutes to protect your child's health responsible enough to coach your child?" If they answer no, I would ask that parents refuse to sign their kids up for programs that do not require CDC certification.

Number two, I would change concussion management. The latest concussion management guidelines support the recommendation that no youth player who is diagnosed with concussion be allowed to return to the same game. I would ask that all organizations formally adopt this guideline and expand this, as the NFL has, to include practices.

And number three, I think we need to focus on practice. We need to put together a commission of medical experts, youth coaches, and youth sports organizations to investigate where we can reduce unnecessary brain trauma in practice, and consider reducing how many days of full contact younger players are allowed. If a handful of drills with higher risk for brain trauma aren't discourage or banned by the fall of 2010, then we aren't really trying.

I believe the biggest barrier to making sports safer for the brain has been overcome. Now that the NFL is putting their immense resources behind solving the concussion crisis, it's up to us to execute the solutions. Thank you for the opportunity to present today.

[The prepared statement of Mr. Nowinski follows:]

PREPARED STATEMENT OF CHRISTOPHER NOWINSKI

CENTER FOR THE STUDY OF TRAUMATIC ENCEPHALOPATHY

Written Testimony of Christopher Nowinski
Co-Director, Center for the Study of Traumatic Encephalopathy
Boston University School of Medicine

President and CEO, Sports Legacy Institute

Before Committee on the Judiciary
United States House of Representatives

Hearing on "Legal Issues Relating to Football Head Injuries, Part II"

Monday, January 4, 2010

Mr. Chairman, Ranking Member Smith, and Members of the Committee, thank you for the invitation to testify again today as a part of the second hearing on brain trauma in football. My name is Chris Nowinski, and currently I am a Co-Director of the Center for the Study of Traumatic Encephalopathy (CSTE) at Boston University School of Medicine, co-founder, president, and CEO of the non-profit Sports Legacy Institute, or SLI, which is dedicated to solving the sports concussion crisis, and a member of the board of directors of the Brain Injury Association of America.

My testimony from the prior hearing on October 28, 2009, provides my background with concussions in sports, beginning with my football career at Harvard University.
At the prior hearing in October, I focused my testimony on two major battles in what is appropriately described as a two-front "concussion crisis." First, to define the issue today as we see it, football is currently plagued by a problem with concussions and also a problem with Chronic Traumatic Encephalopathy, or CTE, the progressive degenerative brain disease caused by repetitive brain trauma, including both concussions and subconcussive blows to the head.

The problem with concussions in football is that there are too many, and they need to be better prevented, reported, diagnosed, and managed. The problem with CTE in football is that in our research at the Center for the Study of Traumatic Encephalopathy at Boston University School of Medicine, we have yet to find a brain of an athlete who played football in college or beyond that doesn't show signs of the disease; which becomes more and more shocking with each additional case. Unfortunately we cannot predict with any accuracy the risk to athletes who only play football through high school, but there is evidence to suggest that the brain damage may begin at the youth level. A recent study by Broglio et. al. that found that high school players take more force to the brain in football collisions than even college players, due partially to the fact that they have weaker necks. In addition, at our Center, Dr. Ann McKee, who testified in the first hearing, identified the beginnings of CTE in a young football player who died at 18.

Fortunately, the solution to both problems appears to be virtually the same – fewer impacts to the head, reduced total brain trauma, fewer concussions, and better diagnosis and treatment of concussions.

The two major battles that were being fought in October highlighted two different aspects of this public health crisis. The first was that truthful information on the risk of CTE and magnitude of the concussion problem, as well as meaningful information on HOW to reduce risk, was not reaching youth athletes, coaches, and parents.

The second was that the National Football League, by denying the clear link between CTE and brain trauma, as well as minimizing the risk of concussions, was subverting the positive efforts of organizations like the Centers for Disease Control and the Sports Legacy Institute. Instead of helping, the NFL was burying its head in the sand, allowing this public health crisis to flourish.

I am amazed to see how much has changed in the last two months since the last hearing.
The hearings in October, backed by growing research and a changing culture, appear to have awakened the NFL in a way many never thought possible, and now the NFL is setting the standard on concussion care and research.

Among the changes announced since the hearing, the NFL, with assistance from the NFL Players Association has:

1. Changed the leadership of their Mild Traumatic Brain Injury Committee
2. Created a rule that players with diagnosed concussions must see an independent neurological expert prior to return-to-play
3. Widened the guidelines for players not allowed to return-to-play the same day of a concussion
4. Instructed the NFL Competition Committee to continue to look for ways to reduce brain trauma in games
5. Developed a committee to look for ways to reduce brain trauma outside of games
6. Influenced change in youth education through
    a. Public Service Announcements approved by the CDC
    b. An online coaching certification curriculum as part of the USA Football training program
    c. Further distribution of the CDC Heads Up program
7. Announced a second mandatory "Concussion Summit" for NFL team medical staffs
8. Developed a program to test safety equipment

Other developments have occurred since that announcement. Under new executive director DeMaurice Smith, the National Football League Players Association continued its strong trajectory on addressing this issue at all levels by officially collaborating with the CSTE at Boston University. They will encourage active and retired players to participate in CSTE research.

The NFL has also taken an active role on the research front, announcing they are encouraging active and retired players to participate in our brain donation program. In addition, the NFL has offered to financially support some of the research conducted at the CSTE, although the details of the arrangement have yet to be worked out. Our research team must always have complete independence from outside interests to maintain the integrity and scientific vigor of the research, and in early conversations the NFL, they have expressed their willingness to support us in a way that maintains our independence.

The changes the NFL has made since October allow us to take a dramatic step forward in addressing this public health crisis. The researchers and advocates can spend more time addressing the actual problem of concussions and CTE, rather than the prior focus on changing the minds of those contributing to the problem.

I imagine many of my colleagues today will point out that the battle with the direction of the NFL's leadership on this issue is far from over, and that in no way should we stop pushing for more change and action on this issue.

There are some who are concerned that the NFL is trying to silence their harshest critics through the promise of research funding.

And there are others, including our many brain donors that are retired NFL players, that will say these changes are too little too late, and that the NFL is still accountable for those injured during the years of denial.

I believe that the fight is far from over, but I am pleased with the direction in which the NFL is moving and impressed with how much has been accomplished; I am now going to focus on what needs to be accomplished going forward. I will say that the NFL's current actions do not erase the past, but from the perspective of saving lives, the only way we can undo the damage is through prevention and developing a treatment or cure for CTE. We do that by moving forward. We've temporarily won the public relations battle and the hearts and minds campaign, but we still can't be sure the changes that have been made will truly protect children playing the game today from developing the cognitive and behavioral impairments caused by CTE in the future.

I'd like to focus on where we go from here to protect those most vulnerable. To begin, we must recognize that not every concussion can be prevented. But in a perfect world, athletes do not suffer unnecessary concussions, athletes do not suffer 'too many' concussions, and concussions are always reported, properly diagnosed, and properly managed.

In a perfect world, sports evolve to reduce total brain trauma (including those milder, repetitive subconcussive hits to the head) to a 'tolerable' level, whatever that may be, so that athletes do not eventually develop CTE due to recreational sports.

Reaching this perfect world has always required a culture change, and a culture change in football has always required a change in the attitudes of NFL players. NFL players are role models and heroes of younger football players. Because of the educational efforts of a large group of doctors, advocates, and members of the media, the information has reached NFL stars. Now that the NFL culture has stopped punishing players for suffering and sitting out with concussions, we've seen that culture change happens virtually overnight.

I was overjoyed to hear Kurt Warner, quarterback for the Arizona Cardinals, say in December, "I can tell you I wrestled with it when I was going down to that room to talk to them (before the game), saying, 'Do I not want to tell them everything so I can play?' But I had to go, 'What are you thinking? This is bigger than that.' The easy thing to do is play. The hard thing is to make that decision where you feel like you could be hurting your team, but you don't know whether you're putting yourself at risk or not."

It's becoming abundantly clear that we've all been locked in a game of chicken. No one wanted to be the first to flinch and admit they'd prefer to sit out when they have a concussion because the culture would question their commitment or strength. Now that athletes are advised to sit out, we are seeing a revolution overnight, and it was clearly simmering just below the surface this whole time. Players can rest with their reputations intact because management and doctors are playing the role of the 'bad guy,' forcing players to sit out 'against their will,' or at least that is the perception. This has also allowed management to step back and see that this behavior actually protects their multi-million dollar investments. I anticipate fewer great players retiring early from concussions. It's really a win-win all around.

It's encouraging to discover NFL players are gaining awareness of the risks of CTE and are willing to discuss it. Philadelphia Eagles running back Brian Westbrook recently said, "That's my biggest concern. How am I going to be when I'm 50 or when I'm 60? Will I have all these brain diseases and will I have a problem remembering things? . . . Now, I'm trying to get myself together with the help of the doctors as well as coach [Andy] Reid and the training staff. Now, the most important thing is to get 100 percent healthy - and not play football . . . until I'm 100 percent healthy."

I felt a hint of nostalgia when the Pittsburgh Steelers' Hines Ward questioned Ben Roethlisberger's commitment when Ben sat out with a concussion. Ward said, "I could see some players or teammates questioning, like, 'It's just a concussion. I've played with a concussion before.' It's almost like a 50-50 toss-up in the locker room. Should he play? Shouldn't he play? It's really hard to say. I've been out there dinged up. The following week, got right back out there."

What Hines said was irresponsible and wrong, but I don't really blame him, because I'm pretty confident no one has ever sat down with him and explained concussions, second-impact syndrome, or CTE. He has likely not seen the ravaged brain tissue of the dead athletes with CTE that our center has studied. And, he has likely not sat down with the widows of deceased players whose CTE destroyed their lives, their marriages, and their families. But what was most fascinating is that no player publicly came to his defense. I think that Ward may have made the last public statement by an NFL player that questions a player sitting out with a concussion. At least, I hope so.

This culture change will almost certainly trickle down to youth sports, especially at the high school level, where athletes are mature enough to understand the risks but less able to incorporate that understanding into behaviors. We must always remember that 95% of football players are under the age of 18 and under the age of consent, so it is our responsibility to not let them throw away their futures with our endorsement.

Teenagers love to imitate their sports heroes, and every NFL player that acts and speaks responsibly on concussions sets a tremendous example.

Smoking has provided many great analogies during these hearings, and it provides another here. Today, close to 100% of Americans know that smoking cigarettes is hazardous to their health. Yet 20% still smoke. And 80% choose not to. I anticipate we can expect a similar level of success, if we can ever reach 100% penetration on education and awareness. Imagine youth sports with an 80% concussion reporting rate. Sure, with player surveys showing concussion rates of around 50%, we may not have enough players left to field a team by the end of the year, but maybe that will inspire us to more urgently find ways to play a safer game.

As we push ahead, let's remember that these educational programs do not do a great job protecting the youngest athletes. Younger players cannot understand concussion risks, and they cannot verbalize their symptoms. Therefore, in this changing culture it seems logical that we rethink how we introduce them to contact and collision sports. It's been said time and time again,

but the younger brain is more vulnerable to brain trauma, and the fewer lifetime hits to the head, the better.

At the first hearing on this issue I entered into the record the Sports Legacy Institute's 10 Point Plan to Save Football. It provides a strong framework to assess our progress in addressing the options available to us to make sports safer.

1. Reevaluate how the game is **practiced**
    - Status – little formal discussion of reducing brain trauma in practice
2. Encourage mandatory brain trauma and concussion **education** for coaches, athletic trainers, parents, and athletes
    - Status – legislation has been passed requiring formal education for high school coaches in Washington, Oregon, and Texas
3. Reevaluate **protective equipment**
    - Status – of the two most obvious options, there is a healthy discussion on helmets, and zero discussion of shoulder pads. The role of mouthguards in concussion reduction remains unclear.
4. Develop better methods of concussion detection and **diagnosis**
    - Status - ongoing
5. Develop better methods of concussion **management**
    - Status - ongoing
6. Consider minimum **medical resources**
    - Status – some discussion of requiring athletic trainers to play football
7. Reevaluate **techniques** of tackling and blocking
    - Status – little formal discussion
8. Reevaluate the **rules**
    - Status – NFL has made changes
9. Reevaluate **rule enforcement** and the role of **referees**
    - Status – not enough discussion
10. Reconsider the **culture** of the game
    - Status – changed at the professional level, trickling down to lower levels

If I could snap my fingers and make changes prior to the 2010 season, I would change the following:

1. **Education for Coaches** – Our Sports Legacy Institute has traveled to schools and gyms to conduct 90 minute Coaches Concussion Clinics for the few programs that so far have chosen to make concussion education a priority. However, we have limited resources, and we cannot be everywhere. The best alternative to live, comprehensive presentation is a shorter, online course. And if it were free and developed by top independent experts, there would be no barriers to adoption. If only it existed!

   The CDC informed me last week that they are in the process of developing a simple, 20 minute certification course using their widely accepted Heads Up program that they hope to be ready within six months. When it is up and running, I would make an online concussion certification program mandatory for all youth coaches, similar to CORI checks. The only problem preventing this from being up and running as quickly as possible is funding – somehow the CDC has not been able to secure the

measly $100-200 thousand dollars required to make it a top notch program. Considering the availability of bailout money from the government, as well as our willingness to spend into debt, I think the government needs to take a look at this as an investment that is easily recouped in lowered future health care costs.

I would then want this program made mandatory through all sports leagues, including USA Football, Pop Warner, American Youth Football, and other football leagues and similar organizations in other sports. I am concerned they do not have the guts to mandate such a program by the fall of 2010 without serious pressure from outside sources, so I also have a plan to create that pressure.

I plan to work with and through parents to get this free online program widely adopted. Because parents sign their kids up for sports, and because parents sign the checks, they can make demands. Parents need to be told this program is available, and free, and that coaches refuse to spend 20 minutes to be certified. I would ask them the following question:

- Is a coach who refuses to invest 20 minutes to protect your child's health **responsible enough** to coach your child?

If they answer is no, then I would ask parents to refuse to sign their kids up for programs that do not require CDC certification.

If organizations continue to refuse to make this education mandatory for their coaches, I can assure them that there are many like-minded groups, including the Brain Injury Association of America and their state affiliates, that are prepared to push through legislature that would require it. I hope it doesn't come to that.

Similar education for athletes and parents should quickly follow.

2. **Management** – The latest concussion management guidelines support the recommendation that no youth player who is diagnosed with a concussion be allowed to return to the same game. I would ask that all organizations formally adopt that guideline and expand this, as the NFL has, to include practices.

3. **Rule Enforcement and Role of Referees** – Referees should continue to increase penalizing helmet-to-helmet hits. Referees should also immediately be trained to recognize symptoms of concussions and given the authority, and the expectation, to send a player to the sideline for evaluation when they appear to have suffered a concussion.

4. **Practice** – We need to put together a commission of medical experts, youth coaches, and youth sports organizations and investigate where we can reduce unnecessary brain trauma in practice, and consider reducing how many days of full contact younger players are allowed. If a handful of drills with higher risk for brain trauma aren't discouraged or banned by fall of 2010, then we are not trying. I dare you to

watch this video on YouTube of eight year-olds and not imagine think there is a better way to train children to play football. http://www.youtube.com/watch?v=Vf-qggLqzds&feature=player_embedded

The other parts of the 10 Point Plan require ongoing discussions in which we can make incremental gains each year. But again, it will be a question of will. Post concussion syndrome is a terrible burden on a child, and CTE is an even worse burden on a family.

I believe the biggest barrier to making sports safer for the brain has been overcome. Now that the NFL is putting their immense resources behind solving the concussion crisis, it is up to the rest of us to execute the solutions.

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Mr. CONYERS. Thank you, Mr. Nowinski, we appreciate your articulate presentation out of—it came out of your own experience, actually.

Kyle Turley, 9 years NFL, and St. Louis, Kansas, and NFL All Pro. His life has been turned around and redirected as a result of what's happened to him in the activity he loves. He's now a member of a number of boards. He's educating and raising money and,

I think, inspiring a lot of other people in this field who, probably like Mr. Turley, hadn't really thought about this part of this profession, and I—I just believe he's affecting lots of people. We're pleased that you're with us tonight.

TESTIMONY OF KYLE TURLEY, RETIRED NFL PLAYER

Mr. TURLEY. Thank you. It's an honor to be here. Thank you, Chairman Conyers, and the respected panel. Before I get started, I've been requested to introduce a video statement by Mr. Mike Ditka, as I call him, "coach," is the chairman and founder of the Gridiron Greats organization that I sit on the board of, so if we could bring that up before I get started, we would like to have this played.

(Whereupon the following is the audio from the videotape that was played by Mr. Turley.)

"Mr. DITKA. Thank you, Chairman Conyers and Members of the Committee. My name's Mike Ditka. I work with the Gridiron Greats assistance fund, and let me tell you a little bit how about we got all involved in this stuff so people—I'm not an expert about anything. All I know is we put a good thing together a few years ago called the Hall of Fame Assistance Trust to who try to help former hall-of-famers who were in dire need, and we raised some money and we did help some people.

"The reason it came to my attention, I notice (inaudible) of the guys that were in the Hall of Fame, people with mental problems, dementia, Alzheimers', whatever you want to call it, and so we put this fund together, and we did help a certain amount of people, so we had a—some people came up against us and claimed this and that and like they always do. If you're doing some something good, then you're doing something bad, I guess.

"So we resolved that front and we started the Gridiron Greats, and we've tried to help all players, all retired players who need help regardless of whether they're hall-of-famers or not, and over the last few years, we helped a significant number of people, but more than helping people, we've created an awareness of the problem, and even the NFLPA and the NFL now is starting to understand when we talked about concussions. And you can have all of the expert doctors, I'm sure you have some there, and they're going to tell you well, this and that, and there's no—no definite evidence that concussions cause dementia or Alzheimer's, and you can say anything you want to.

"You know, some doctor might tell you smoking doesn't cause cancer because in some people it probably wouldn't. But you know, it gets silly after a while. The only thing we did—that we are trying to do is to help people, and like I said, we created a lot of awareness because there are people out there who need help.

"Now the National Football League Players Association is an association that we all pay dues into. I was here when it started. We all fought for it, we all went on strike, we all know what it's all about. Whether we agree with everything they do or not, the core obligation and responsibility is to represent the players. The players are the National Football League. Present, future, and past. And past. We're all a part of it. This league didn't become a billion-

dollar business, these owners didn't get rich today or these players didn't get rich just because somebody waved a magic wand.

"What happened is there was a time where guys played this game, played a lovely game, made very little money, got a lot of injuries, suffered a lot of hardships after football, always had to have two jobs, these guys are the foundation, whether it was in the thirties, the forties, the fifties, the sixties, or the seventies. These guys were the foundation of what now gets—what's called the National Football League, which is a multi-billion-dollar business. Nobody's losing any money.

"But there are guys losing their health. There ought to be some kind of a program where we can put in place to help these guys who are having these health problems, and that's all we're trying to do. But every time we try to do something, somebody points the finger at us and says, oh, you're wrong, or somebody from the NFLPA says well, you can't do that. Well, why can't we do it? What's wrong with it? Why haven't you done it? Why haven't you cared enough to do something?

"And the National Football League owners, too. They took every pound of blood they could out of these players. Give some of it back. Now (inaudible) why we paid them (inaudible).

"But there are certain risks that came with that playing and they gave you everything they had, give them something back. If you're going to take a pound of flesh, give them a pound of flesh back, that's all I'm trying to say. I don't have the answers to all of this, and I don't want to get into an argument with anybody. I'm just what we're doing and why we're doing it.

"Now if that's wrong, then maybe you can assist us with doing what we're doing. And we'll let the might National Football League or the player's association take care of the guys that need help then. But we're not going to do that for the time being.

"So it's about time somebody woke up. You know, we talk about all the things, we talk about politics and change and this and that. Let's just use some common sense. Get away from this nonsense where everybody wants to get up there and pontificate about this and that and that, and we have this article, we came—you know, we don't care about that. These are guys who helped found the National Football League. Give them a break, will you? Let them live out their life with some dignity. Do the right thing."

[Applause.]

Mr. TURLEY. With that, I'd like to go into my prepared statement. Again, thank you, Chairman Conyers, Congresswoman Sánchez and Congressman Cohen. It is an honor for me to be with you today to discuss this great interest to the public of the issue of head injuries in professional football or football in general.

As this committee has begun to demonstrate, that issue extends to football at all levels, from youth leagues to NFL, from football to other sports. I feel a double measure of honor and responsibility today since I have been given the opportunity to speak for many who have no voice, for countless men, women, and children who, though they never played a 'down' in the NFL, nevertheless, face the reality of life after traumatic brain injuries.

I am here to further assist the great work that has been done by this committee by some of the distinguished medical experts on

this panel—and I'd emphasize distinguished because there are some that aren't, and by others, some of them ex-NFL players—to educate and find solutions for this epidemic. Having personally suffered multiple concussions, I can speak firsthand of the terrifying symptoms I continue to experience as a result, not only immediately following brain injury but years afterward as my faculties continue to degenerate, and my life continues to change.

For myself, I can actually take some solace from the fact every one of my injuries is a direct result of living my dream of having a storied career in the NFL, even through the tough times I can say to myself that it was worth of all to have lived that dream and wear my scars like so many badges of honor, but there are others to think of, some of them ex-football players, some not. For their sake, for their pain, I cannot allow myself to be silenced by my own sense of consolation.

Among those others is my newborn son. As we celebrated his first Christmas, I brooded on the thought that he might have his own future of playing sports and that if he does and the current mentality on head trauma does not change, he will likely face the same problems I'm facing now. No amount of consolation will make me silent for that prospect. Like anyone, I want my child to live in a better world than I did.

My presence before you today represents my commitment to that idea. As I watched the hearing on—that your Committee held recently in Washington, I cannot help but to notice the comments of some Members of Congress, and in my view, all of the representatives of the NFL that still seem to be reactive rather than proactive in confronting the issue of traumatic brain injury in football, as if it had only recently been discovered. The fact that it is—the fact that has been represented by many is that the Center For Disease Control characterized second impact syndrome and traumatic brain injury in 1984 in a report that presented recommendations developed by the American Academy of Neurology to prevent recurrent brain injuries in sports and their adverse consequences.

A subsequent version of that report includes the following case: During a 1991 game, a 17-year-old high school football player was tackled on the last play of the first half of a varsity game and struck his head on the ground. During halftime intermission he told the teammate that he felt ill and had a headache. He did not tell his coach. He played again during the third quarter and received several routine blows to the helmet during blocks and tackles. He then collapsed on the field and was taken to a local hospital in a coma.

A computed tomography or CT scan revealed diffuse swelling of the brain and a small subdural hematoma. He was transferred to a regional trauma center where attempts to reduce elevated intracranial pressure were unsuccessful, and he was pronounced dead, brain dead 4 days later. Autopsy revealed diffuse brain swelling, focal areas of subcortical ischemia, and a small subdural hematoma.

This example is not common, but it is not nearly as rare as it should be, either. This problem does not need more review. It doesn't need more doctors, it needs action now. As Merril Hoge suggested in your last hearing, coaches at all levels of the game, but

particularly in high school and youth league football, need to be systematically educated about concussions and the implication of playing through the pain of a head injury, but all injuries in my mind, so that examples like this one that are not just rare, but nonexistent in the future.

That educational effort must have the full public support of the NFL, the Player's Association, and every player in the league, past and present. Like it or not, as professional football players, we are role models. Kids not only look up to us, they emulate us in every way we play the game. If human casualties are not enough to move us all to action, let us have a hard look at the financial toll traumatic brain injury has inflicted on the United States alone.

According to another CDC study, at least 5.3 million Americans currently have a long-term or lifelong need for help to perform the tasks and engage in daily activities of living as a result of TBI, traumatic brain injury. In the year 2000 alone, the study confirmed that direct and indirect costs of traumatic brain injury in the United States totaled an estimated $60 billion. As we sit and continue to discuss these matters, our country continues to suffer from one of the worst medical epidemics and financial disasters it has ever known.

Members of the Committee, what follows is a description for the diagnosis and treatment of a grade 3 concussion suggested by the American Academy of Neurology in a 1997 report and is contrary, as I go through my example of it, of what Dr. Casson believes is the medical practice of the National Football League since these studies came out.

A grade 3 concussion, the definition is a loss of consciousness, either brief, seconds, or prolonged. The management, the athlete should be removed from sports activity one full week without symptoms if the loss of consciousness is brief or two full weeks without symptoms if the loss of consciousness is prolonged. If still unconscious or if abnormal neurological signs are present at the time of the initial evaluation, the athlete should be transported by ambulance to the nearest hospital emergency department.

An athlete who suffers a second grade 3 concussion should be removed from sports activity until asymptomatic for 1 month. Any athlete with an abnormality on computed tomography or magnetic reconnaissance (sic) imaging/brain scan consistent with brain swelling, contusion, or other intracranial pathology should be removed from sports activities for the season and discouraged from future return and participation in contact sports. Pretty detailed. A lot of examples there, very detailed.

Now, I would like to explain to you my experience. After having suffered a grade 3 concussion in 2003, again, 2003, while playing for the St. Louis Rams. On the last play of the third quarter in a Sunday game versus the Green Bay Packers, I was struck in the back of the head by an opposing player's knee. I lay unconscious for close to a minute and was revived by the team medical staff by the use of ammonia caps.

I was then guided to the sideline, placed on the bench. While sitting on the bench, I was approached by players, coaches, and medical staff, all of which I had very little recollection. Out of concern for my wife, I remember trying to look for her so that I could wave

and give her some peace of mind, but I was unable to remember that our seats, which we have all season long, were located just over my left shoulder.

After what seemed like only a few minutes, I was approached by a member of the team medical staff and escorted to the locker room. While walking off the field, I glanced up at the scoreboard to see that there was just over a minute left in the game. I was knocked unconscious the last play of the third quarter. A quarter of football can take up to an hour. Yet, I sensed virtually no passage of time.

After being taken to the locker room, I went through the usual motions of getting ready to go home. The medical staff then led me to a small room where they had my wife wait for me. They released me into her care with the suggestion that she take me to the hospital. As my wife guided me down to the hallway toward the stadium exit, I was fortunate enough to run into an old teammate who assessed the state I was in and told my wife that she needed to get someone to help her take me to the hospital since she could hardly hold me upright.

She found a police officer who kindly took us in his car and drove us directly to the emergency room. There I was given an immediate CT scan and was kept overnight for observation. After being released from the hospital, I was told by the team to go home and rest and that I would be reevaluated by the team medical staff on Wednesday. After meeting with the Rams' medical staff, I was not examined but merely asked how I felt. I was then told not to participate in practice that day and that they would reevaluate me the next day, Thursday.

After their evaluation on Thursday, I was cleared for practice and full contact drills, though I still had a severe headache. I went on to practice that day, frustrated with being injured, and wanting to prove my toughness to my teammates and coaches, I used my head more aggressively than I normally would have in practice, not understanding the damage I was doing to my brain.

I would like to tell you that this was an isolated incident, just as Dr. Casson would, and that the situation was unique, but my experience, both as a player and as a board member of the charity focused on the needs of injured and retired players, it is that the negligence of the NFL medical staff is fairly universal, that its effects are perpetuated and magnified by the NFL disability committees, the protection they enjoy under the collective bargaining agreement comprised of the owners and players' union representatives which continually deny retired players disability claims wrongfully and that acting players continue to be put into the game after suffering concussions, which I viewed during this football season.

Like my fellow Gridiron Greats board member, Mike Ditka, I hope that my fellow panelists today, DeMaurice Smith, who's not with us now, will forge a new path for the NFL Players Association, but history has taught me to cast a very skeptical eye. As Mike said, if Mr. Smith's deeds match his words and retired players, who found little help at the hands of his predecessor, begin to experience solid benefits as a result, he will have my firm support,

as many others. Like all of my retired brethren and their families, I will be watching.

As a child, I dreamed of playing in the NFL and being a part of an elite fraternity of brothers. The reality of my exper—the reality I have experienced, however, is quite the contrary. From the inside, I have watched the continued arrogance of the NFL owners and player's association as they neglect the health of those whose careers they should protect. In my retirement and in my work as an advocate for other retirees, I continue to see myself, my friends, and the heros of my youth dismissed and thrown away as if all the hard work and dedication they put into building the NFL into the success it is today meant absolutely nothing.

Mr. Chairman, Members of the Committee, I'm here to say that we are not commodities. We are made of flesh and blood, we have families that need to be cared for as they care for us. It is my recommendation of the many others that it be a legal obligation backed by serious sanctions for every athletic team, professional or otherwise, to have the information of the CDC reports on concussions be prominently posted in every locker room that it be mandated that those materials be read and clearly explained to all players and coaches by a neurological medical professional.

Moreover, once a player presents with complaints or symptoms associated with head injury, that player should be immediately taken out of the game or practice in which he is participating for the rest of that day and be examined by a neurological professional immediately. I also propose that this committee undertake an investigation of the history of benefit and disability denials by the NFL and National Football League Players Association a disability system that is conflicted in the way it serves to align the interests of both the NFL and the NFLPA against those of the disabled players whose welfare both organizations are supposed to consider objectively. To date, they have not.

In closing, I would like to say the key element that has brought us together here is a general loss of focus on the most important purpose of playing sports, promoting health while having fun. Instead, the NFL has become a game literally about life and death. With the Committee's help, I hope we can all work together to change that and put health back into the game. It has been sidelined long enough. Thank you for the opportunity to testify before you today. I yield.

[The prepared statement of Mr. Turley follows:]

PREPARED STATEMENT OF KYLE TURLEY

Testimony of Kyle Turley

Disabled Retired NFL Player

and

Board Member of the Gridiron Greats Assistance Fund

Before the House Committee on the Judiciary:

Field Hearing: Legal Issues Relating to Football Head Injuries (Part II)

Wayne State University School of Medicine

Margherio Family Conference Center, Room 1460

540 E. Canfield St., Detroit Michigan

January 4, 2010, 1:00 p.m.

Chairman Conyers and distinguished members of the Committee on the Judiciary, thank you for honoring me with your invitation to come before you and discuss a matter of great interest to the public—the issue of head injuries in professional football. As this Committee has begun to demonstrate, that issue extends to football at all levels, from youth leagues to the NFL, from football to other sports. I feel a double measure of honor and responsibility today, since I have been given the opportunity to speak for many who have no voice: for countless men, women and children who, though they never played a down in the NFL, nevertheless face the reality of life after traumatic brain injuries. I am here to further assist the great work that has been done by this Committee, by some of the distinguished medical experts on this panel, and by others, some of them ex-NFL players, to educate and find solutions for this epidemic.

Having personally suffered multiple concussions, I can speak first-hand of the terrifying symptoms I continue to experience as a result, not only immediately following brain injury, but years afterward, as my faculties continue degenerate and my life continues to change. For myself, I can actually take some solace from the fact that every one of my injuries is the direct result of living my dream of having a storied career in the NFL. Even through the tough times, I can say to myself that it was worth it all to have lived that dream and wear my scars like so many badges of honor. But there are others to think of--some of them ex-football players, some not. For their sake, for their pain, I cannot allow myself to be silenced by my own sense of consolation. Among those

others is my newborn son. As we celebrated his first Christmas, I brooded on the thought that he might have his own future of playing sports that, if he does and the current mentality on head trauma does not change, he will likely face the same problems I'm facing now. No amount of consolation will make me silent before that prospect. Like anyone, I want my child to live in a better world than I did. We're all obligated to try to do that, right? My presence before you today represents my commitment to that idea.

As I watched the hearing your Committee held recently in Washington, I could not help but notice that the comments of some Members of Congress and, in my view, all representatives of the NFL still seemed reactive rather than proactive in confronting the issue of traumatic brain injury in football, as if it had only recently discovered. The fact is that the Center for Disease Control characterized "Second Impact Syndrome" in 1984 in a report that presented recommendations developed by the American Academy of Neurology to prevent recurrent brain injuries in sports and their adverse consequences (See "Sports-Related Recurrent Brain Injuries—United States" in *MMWR Weekly*, March 14, 1997 / 46(10) pp. 224-27).

A subsequent version of that report includes the following case. I'm sorry, but it makes for tough reading:

> During October 1991, a 17-year-old high school football player was tackled on the last play of the first half of a varsity game and struck his head on the ground. During halftime intermission, he told a teammate that he felt ill and had a headache; he did not tell his coach. He played again during the third quarter and received several routine blows to his helmet during blocks and tackles. He then collapsed on the field and was taken to a local hospital in a coma. A computed tomography (CT) brain scan revealed diffuse swelling of the brain and a small subdural hematoma. He was transferred to a regional trauma center, where attempts to reduce elevated intracranial pressure were unsuccessful, and he was pronounced brain dead 4 days later. Autopsy revealed diffuse brain swelling, focal areas of sub-cortical ischemia, and a small subdural hematoma.

This example is not common—but it is not nearly are rare as it should be, either. This problem does not need more review. It needs action—right now! As Merrill Hoge suggested in your last hearing, coaches at all levels of the game, but particularly in high school and youth league football, need to be systematically educated about concussions and the implications of "playing through the pain" of a head injury, so that examples like this one are not just rare, but non-existent in the future. That educational

effort must have the full public support of the NFL, the NFLPA and every player in the league, past and present. Like it or not, as professional football players, we *are* role models. Kids not only look up to us, they emulate us in the way we play the game. De-romanticizing the kind of play, even the kind of attitude, that needlessly, sometimes even cruelly, endangers other players' health or stupidly sacrifices one's own starts with this generation of players and owners because *we know better now.*

If the cost measured out in destroyed or disabled human beings is not enough to move us all to action, let us have a hard look at the financial toll TBI has inflicted on the United States alone. According to another CDC study, at least 5.3 million Americans currently have a long term or lifelong need for help to perform the tasks and engage in the activities of daily living as a result of TBI. In the year 2000 alone, the study confirmed that the direct and indirect cost of TBI in the United States totaled an estimated $60 billion dollars.

As we sit and continue to discuss these matters, our country continues to suffer from what is, at the same time, one of the worst medical epidemics and one of the worst financial disasters it has ever known. Whether measured in blood or treasure, the cost should startle us. That much of the cost, certainly much that is associated with sports, is also avoidable should outrage us and spur us to action.

Members of the Committee, what follows is a description for the diagnosis and treatment of a Grade 3 concussion suggested by the American Academy of Neurology in a 1997 report:

> Grade 3 Concussion
> -- Definition: Loss of consciousness, either brief (seconds) or prolonged (minutes or longer).
> -- Management: The athlete should be removed from sports activity1 full week without symptoms if the loss of consciousness is brief or 2 full weeks without symptoms if the loss of consciousness is prolonged. If still unconscious or if abnormal neurologic signs are present at the time of initial evaluation, the athlete should be transported by ambulance to the nearest hospital emergency department. An athlete who suffers a second Grade 3 concussion should be removed from sports activity until asymptomatic for 1 month. Any athlete with an abnormality on computed tomography or magnetic resonance imaging brain scan consistent with brain swelling, contusion, or other intracranial pathology should be removed from sports activities for the season and discouraged from future return to participation in contact sports.
>
> [Source: Quality Standards Subcommittee, American Academy of Neurology.]

Now I would like to explain to you my experience after having suffered a Grade 3 concussion in 2003 while playing for the St. Louis Rams. On the last play of the third quarter in a Sunday game versus the Green Bay Packers, I was struck in the back of the head by an opposing player's knee. I lay unconscious for close to a minute and was

revived by the team medical staff by the use of ammonia caps. I was then guided to the sideline and placed on the bench. While sitting on the bench, I was approached by players, coaches and medical staff, all of which I have very little recollection. Out of concern for my wife I remember trying to look for her so that I could wave and give her some peace of mind, but I was unable to remember that our seats, which we had all season, were located just over my left shoulder.

After what seemed like only a few minutes, I was approached by a member of the team medical staff and escorted to the locker room. While walking off the field I glanced up at the scoreboard to see that there was just over a minute left in the game. A quarter of football can take up to an hour, yet I sensed virtually no passage of time. After being taken to the locker room, I went through the usual motions of getting ready to go home. The team medical staff then led me to a small room where they had my wife wait for me. They released me into her care with the suggestion that she take me to the hospital.

As my wife guided me down the hallway towards the stadium exit, I was fortunate enough to run into an old teammate who assessed the state I was in and told my wife that she needed to get someone to help her take me to the hospital since she could hardly hold me upright. She found a police officer who kindly took us into his car and drove us directly to the emergency room. There I was given an immediate CT scan and was kept overnight for observation. After being released from the hospital, I was told by

the team to go home and rest and that I would be re-evaluated by the team medical staff on Wednesday.

After meeting with the Rams medical staff, I was not examined but merely asked how I felt. I was then told not to participate in practice that day and that they would re-evaluate me the next day (Thursday). After their evaluation on Thursday, I was cleared for practice and full-contact drills, though I still had a severe headache. I went on to practice that day. Frustrated with being injured and wanting to prove my toughness to my teammates and coaches, I used my head more aggressively than I normally would have in practice, not understanding the damage I was doing to my brain. Well, I understand now, but that knowledge was bought very dearly.

I would like to tell you that this was an isolated incident and that the situation was unique, but my experience, both as a player and as a board member of a charity focused on the needs of injured retired players, is that the egregious negligence of NFL team medical staff is fairly universal, that its effects are perpetuated and magnified by the NFL disability committees, comprised of the owners and the players union representatives, which continually deny retired players' disability claims wrongfully, and that active players continue to be put into the game after suffering concussions. Like my fellow Gridiron Greats Board Member, Mike Ditka, I hope that my fellow panelist today, De Smith, will forge a new path for the NFLPA, at least. But history has taught me to cast a very skeptical eye on that organization. As Mike has said, if Mr. Smith's

deeds match his words and retired players, who found little help at the hands of his predecessor, begin to experience solid benefits as a result, he will have my firm support. Like all of my retired brethren an their families, I will be watching.

As a child, I dreamed of playing in NFL and being part of an elite fraternity of brothers. The reality I have experienced, however, is quite the contrary. From the inside, I have watched the continued arrogance of NFL owners as they neglect the health of those whose careers and talents one would think they should protect, in that they represent investments measured in millions of dollars. Perhaps it is an index of the owners' enormous fortunes that they consider even talent like that, and human beings like that, to be no more than a fungible commodity. In my retirement, and in my work as an advocate for other retirees, I continue to see myself, my friends and the heroes of my youth dismissed and thrown away as if all the hard work and dedication they put into building the NFL into the huge financial success it is today meant absolutely nothing.

Mr. Chairman, Members of the Committee, I am here to say that we are not commodities. We are made of flesh and blood and we have families that need to be cared for as they care for us. It is my recommendation, among many others, that it be a legal obligation, backed by serious sanctions, for every athletic team, professional or otherwise, have the information of the CDC reports on concussions be prominently posted in every locker room, and that it be mandated that those materials be read and clearly explained to all players and coaches by a neurological medical professional.

Moreover, once a player presents with complaints or symptoms associated with head injury, that player should be immediately taken out of the game or practice in which he is participating for the rest of that day and be examined by a neurological professional immediately. I also propose that this Committee undertake an investigation of the history of benefit and disability denials by the NFL and NFLPA though a disability system that is hopelessly conflicted in the way it serves to align the interests of both the NFL and the NFLPA against those of the disabled players whose welfare both organizations are supposed to consider objectively. To date, they have not.

In closing, I would like to say that the key element that has brought us together here today is a general loss of focus on the most important purposes of playing sports—promoting health while having fun. Instead, the NFL has become a game literally about life and death. With the Committee's help, I hope we can all work together to change that and put health back into the game. It has been sidelined long enough.

Thank you for the opportunity to testify before you today.

Kyle Turley

Mr. CONYERS. Thanks so much. [Applause.]
Your testimony has been most moving.
Mr. TURLEY. Thank you.
Mr. CONYERS. I appreciate your continued commitment to make sure that we do something.
I yield to Linda Sánchez to take her leave from us this evening.

Ms. SÁNCHEZ. Thank you, Mr. Chairman, and I just wanted to let the second panel know I've heard about half of the testimony, and I'm sorry I'm going to miss the second half of the second panel. I have a flight to catch back home to my 7-month-old who just celebrated his first Christmas. But I wanted to assure you, Mr. Turley, based on your testimony, we started the investigation into this issue based on denied claims of disability for retired players, and that is still the goal of this committee, to continue that work until we feel like those have been taken care of in a way that they deserve to be. So rest assured that that is not forgotten about, that issue.

I want to thank the Chairman again for holding the wonderful hearing here in Detroit, and we hope to continue working on this issue to follow up on some of these other issues that need to be addressed.

Mr. CONYERS. Thank you very much.

We haven't had a lawyer here today——

Mr. COHEN. Will you yield for a minute.

Mr. CONYERS. Yes.

Mr. COHEN. Ms. Sánchez, when you see the sun, would you call me and remind me what it looks like.

Ms. SÁNCHEZ. Yes.

Mr. CONYERS. Robert L. Schmidt, Founder and Chairman of the Vincent Lombardi Foundation, former member of the Board of Governors of Georgetown University, distinguished lawyer in his own right, and who has spent so much time in the media industry, television and a whole variety of communications' organizations, that he's either led or been a part of, we're certainly pleased that you could be with us today.

TESTIMONY OF ROBERT L. SCHMIDT, CHAIRMAN AND CO-FOUNDER, VINCENT T. LOMBARDI FOUNDATION

Mr. SCHMIDT. Mr. Chairman, Congressman Cohen, I'm humbled to be here. First of all I want to brag on the man sitting to my right. He's the real deal, and as you know, there is been a schism that I think is on its way to being healed whereby the NFL owners and the NFL Players' Association in previous hearings clearly stated they didn't represent the retired players, and I remember your words specifically, Mr. Chairman, and I—I wrote them down.

Kyle Turley was one of the first players who was still employed as a player to donate a game check. He was severely criticized for doing so by many of his fellow players and others. Now, that shows you the absolute irony that Mike Ditka was talking about in his video, and to me, you know, the issue here, which I'll get into about concussions, and so on, begs the question. The question is your oversight is absolutely critical to maintain some level of equity that these players, retired and soon to be retired, do not have the leverage in this equation.

The 32 owners of the NFL teams have built a $40 billion business, it generates $8 billion annually. How I got involved goes back to 2006. I'm still a working man. I'm an entrepreneur, I have a small business in the broadband wireless area, but I'm here today because of my passion and commitment to a teammate. Willie Wood and I were teammates at the University of Southern Cali-

fornia. Willie Wood has an incredible distinguished career. I transferred from the University of Notre Dame, where I had brief experience as a quarterback there and showed up at USC, and Willie was the first Black quarterback in post World War II in college, in a major college environment. Willie beat me out for the quarterback job, but I say I got even, I became his lawyer. Now I'm his guardian, and as I tell people, we've been friends for over 50 years, he's my Black brother from another mother, and that's the way it's gonna be.

Now, what we can do about it is something that I want to play whatever role necessary to help facilitate. I think Willie Woods' story is not unique. I think it's very, very similar to many, many players, and in his case, he's living a quality of life today because he has friends and family and others who've surrounded him. There are many players who don't have that. And specifically, I don't want to be ungrateful, there is a program called the John Mackey 88 Fund.

And you should know that John's wife, Sylvia, is probably the single reason why that program is in existence. She personally lobbied Paul Tagliabue, then-head of the NFLPA Dean Upshaw, to make it happen. We now receive benefits because Willie is declared a beneficiary of that because of his dementia. In addition to his dementia, Willie's had two major knee surgeries, two new hips, and three major back surgeries.

Today, I have him in an assisted living facility in Washington, D.C., a wonderful place that takes great care of him, but he has to be lifted out of bed, he cannot get out himself. He will always be in a wheelchair, but I have to tell you he's got the same sunny disposition he's always had since the day we met. He hasn't got an unkind word for anybody, but he did say to me, "Bob, you have to give the best you can to help my brethren."

These men, in my opinion, are the modern day version of gladiators, and they have, as Kyle said aptly, been treated like a commodity. Now, I can't say that it's universal. There's one owner that I can speak of, Al Davis, who happened to recruit Willie out of high school at the University of Southern California, who's maintained his loyalty and has given financial support to us, but I can't name any other owner. Now, the point is the 88 Fund is a good attempt, but it needs to be revised.

If you tell me that a program that's designed for dementia is geared to the former players' number, No. 88, and this is the maximum benefits of $88,000, I'm telling you something's wrong with that plan. Today, we receive $7,333 a month for Willie's support. We have a deficit of about a hundred dollars a day that we make up through card signing, his small NFL pension, and his Social Security, but it's a struggle every month. But guess, what? It's our struggle. And I can't think enough the Gridiron Greats, the Pro Football Hall of Fame, Mike Ditka's foundation, his former NFL teammates, his Packer teammates.

The people who care have rallied, but that begs the question. The system is broken; it needs to be fixed. Concussions is a huge part of the problem. But at the same time, as long as the leverage is in the hands of those 32 owners—and that's why your role is so important—you have to help continue to create this oversight because

the light you put on this issue keeps the issue burning, and as long as it's burning, you're going to see results like you've been able to get in this big step of acknowledgment of concussions and a correlation with dementia and Alzheimer's. Thank you very much.

[The statement of Mr. Schmidt follows:]

PREPARED STATEMENT OF ROBERT L. SCHMIDT

Testimony of Robert L. Schmidt

Chairman/Co-Founder, Vincent T. Lombardi Foundation

Before the House Committee on the Judiciary:

Field Hearing: Legal Issues Relating to Football Head Injuries (Part II)

Wayne State University School of Medicine

Margherio Family Conference Center, Room 1460

540 E. Canfield St., Detroit Michigan

January 4, 2010, 1:00 p.m.

First of all I want to acknowledge you, Mr. Chairman, and your fellow Members of the House Judiciary Committee for your leadership in bringing to light the issue of concussions and their long-term impact on athletes, and specifically for what you have done to aid the retired players of the National Football League concerning their lack of health benefits. I want, of course, to thank you, as well, for the opportunity to testify on these very important issues today. I'm going to try and address the issues you raise today though the history of my friendship with a very special man, Willie Wood, the Hall of Fame defensive back for the great Green Bay Packer championship teams of the 1960s and one of my greatest friends in life. Willie's story, I think, draws together all the equities this Committee should consider as it performs oversight and considers policy in the area of football-related concussions and other issues affecting NFL retirees.

In late 2006, Willie Wood, NFL All Pro Green Bay Packer and Pro Football Hall of Famer, was hospitalized after an accident in his home in Washington DC. Willie is my former college teammate, close friend and sometime legal client. When I arrived at Providence Hospital to see him, he did not recognize me and could not feed himself. My initial concern was that he might have had a stroke. My own involvement with the acute medical issues that impact retired NFL players began that day.

As a result of being a "hard-hitting" defensive back for 11 years with the Packers, playing at 175 pounds, Willie had suffered many physical injuries and concussions. Willie thus had some physical problems prior to his fall at home and used a crutch and cane to get around in the house. His adult son lived downstairs in the house and had begun to notice some memory issues with his dad. For instance, he would get lost easily when driving. So, after a few incidents, he took his father's car keys away from him.

Over the past ten years, Willie has had several major surgeries; including several back surgeries, bilateral hip replacements and knee replacement. His weight during his playing days never exceeded that perfectly toned 175 pounds. Now, however, he packed as much as 265 pounds on his 5-foot, 10-inch (in thick socks!) frame. Because of his fall at home, he needed his other knee replaced. He would soon need much more.

Willie Wood grew up on the segregated streets of Washington, D.C. in the 1940's and 1950's when, if you had talent, sports was a surer way to seek a better life for a young African American man. Willie had talent in abundance. He was an incredible athlete who excelled in all sports, whether he was playing basketball "one-on-one" with Elgin Baylor at the D.C. Police Boys and Girls Clubs or quarterbacking the D.C. Public Schools All Stars and winning the city MVP award. He had a standing vertical jump of close to 40 inches!—a God-given

ability allowed him to dunk a basketball easily and play defensive back in the NFL at a relatively diminutive height for a pro at that position, even in the 1960s.

Willie was not only a great football player and athlete but, as history would have it, a social pioneer at every level of the game of football, as this brief list of highlights from that career will show: In 1954, Willie played quarterback and won MVP honors in the first integrated high school football game in Washington, D.C., when the Public School All Stars played St. John's Catholic High School. In 1957, he was recruited by Coach Al Davis (a current NFL owner) of the University of Southern California, where Willie quietly made history again, becoming the first black quarterback at a major American university. I'll insert a the less historically important fact, here, but to me the most important one about Willie's life at that time: it was here, at U.S.C. that he beat me out of the quarterback spot I had transferred from Notre Dame to claim, becoming my friend for life in the process. Our 1959 USC team, in a decision very progressive for its time, elected Ron Mix and Willie as Co-Captains. Mix a Jew and Willie a Black man were the subject of hate mail, both for who they were as individuals and for publicly sharing this honor. Later, they would both become members of the Pro Football Hall of Fame. Through it all, from then to now, they were, and they remain, teammates and friends. Willie had an 11-year Hall of Fame career as one of greatest defensive backs in NFL history with the Green Bay Packers.

Willie then went into coaching, beginning his coaching career at the highest level, in the NFL, when he joined the San Diego Chargers as an assistant defensive coach from 1972-1974. Then, once again, Willie broke new ground when he became the first Black head coach for the Philadelphia Bell in the World Football League in 1975, and in 1980 he was named the first black head coach in the Canadian Football League with the Toronto Argonauts. Many thought he would be the first Black head coach in the NFL. Clearly, he was the most qualified. But it would be up to another pioneer to break that barrier.

Having achieved excellence at every level of football, Willie choose to leave the sport, return to Washington, D.C. and begin a career in business doing construction projects under government minority set aside programs, at which he distinguished himself again until his health began to fail in early 2000. As I mentioned earlier, He had several major back surgeries, both hips and a knee replacement.

As the public, for the most part, does not understand, Willie and all of his contemporaries in the 1960s and well beyond did *not* make a fortune player professional football. Willie's average salary during his entire playing career was $30,000, but for his final year in 1971 when he made $90,000. After leaving football, he was able to launch a successful mechanical consultation company in the D.C. area, which he operated for about 10 years before retiring in the year

2000. Like most football players of his day, he made more after he left the game. Like too many others, no amount would have been enough to pay the future medical bills resulting from his NFL career.

After his fall in October of 2006, the doctors at Providence Hospital diagnosed him as having dementia and it became clear to his family and to me that we needed to find new sources of support for him as he was released from the hospital in 2007.

Willie's wife Shelia had passed away in 1988 and he lived alone as a widower. He had an adult son, Willie Jr. who lived parttime downstairs in his home, when he wasn't away coaching in the Arena Football League. After he was released from the hospital, we moved Willie into an assisted living facility in nearby, Hyattsville, Maryland, where he could receive 24-hour care for the next several months until he went into the Washington Hospital Center for his second knee replacement in March of 2007. Still very hopeful that he would regain his ability to walk, he was put through an extensive rehabilitation program for several weeks following the surgery. Unfortunately, the results were not favorable.

We then moved Willie into the Residence at Thomas Circle in downtown D.C. in April of 2007. That was our best choice for Willie since friends and family could

more easily visit him there. We did this with the intention of moving him back to his home after some needed renovations were made to accommodate his wheelchair. Unfortunately, Willie does not respond well enough to the physical therapy he gets there to be able to get himself out of his wheelchair. Today he has to be lifted up on a lift to get out of bed and into a wheelchair each day as his physical and mental condition continues to deteriorate.

Willie Wood qualified for the NFL "88 Fund" Program for players with Alzheimer's/Dementia in September 2007 after being certified by NFL doctors as suffering from dementia. The program is named in honor of the great former Baltimore Colt tight end, John Mackey, who wore number 88 on his uniform. The program provides an eligible player up to $88,000.00 in annual support, *if* he remains in an approved assisted living facility, which amounts to $244.00 per day. The current daily charge of $330.00 for 24-hour care results in a deficit of $86.00 per day in Willie's case. The 88 Plan doesn't cover Willie's medicines or any other costs beyond his room and board. We struggle to make up the deficit from his Social Security and his small NFL retirement each month.

At one point, we considered taking Willie home to his modest house on 16th street in Washington, D.C. This would have been a financial disaster since the 88 Plan would cut his monthly subsidy from $7,333 to $5000 per month and no

family member could be reimbursed or receive any compensation for his 24-hour care which he needs.

We don't want to sound ungrateful for the benefits Willie Wood receives under the current NFL program, but it is clear from our experience there is a pressing need for some changes to maximize the intended benefits of the existing 88 Plan—among them the structural disincentives to home care and the support cap based on John's number, which inexorably devalues the plan that bears his name over time in a way he would never support—all of which I will be pleased to discuss with the Fund administrators or Members of the Committee.

The issue of concussions and the high incidence of Alzheimer's/dementia among NLF retired players is only too evident to those with eyes to see and, thanks to your leadership Mr. Chairman, the public is finally gaining that vision and the matter is finally getting the proper attention.

Fortunately, As Chairman of the Vincent T. Lombardi Foundation, I was in a position to come to the aid of Willie and some of the other retirees suffering from medical issues. Shortly after Willie's accident in 2006, we hosted a fundraiser for him in DC in which we were able to raise $50,000 to pay off some of his medical bills. Other organizations and friends like Mike Ditka's Foundation, the Pro

Football Hall of Fame, the Gridiron Greats, and Willie's Packer teammates and fellow NFL players, among others, were all helpful. The NFL's retirement system is still broken and, but for the generosity of the groups and individuals just mentioned, many of these NFL Retired Players would be worse off than Willie Wood and probably less able to cope than he is, both from his exceptional internal resources and the broad network of friends he still enjoys. This is a moral issue for the NFL and the longer it goes unresolved the more the image of the owners as greedy self-serving individuals grows. It has now reached a point where it is hurting the game itself, particularly over the inhumanity and disingenuousness with which the NFL has traditionally addressed the issue of football-associated head injuries. It has been only a matter of days, and only under the pressure of continued Congressional oversight, since the NFL publicly admitted what any adult with a modicum of life experience recognized intuitively—that there is a direct connection between head injuries and degenerative brain diseases like dementia. In this area, we have long been waiting for the science to catch up with that intuition. It has for some time now, which the distinguished medical witnesses today can confirm definitively. We are only now seeing a glimmer of hope that the NFL has caught up with that established reality.

I had the opportunity to meet Coach Vincent Lombardi with Willie Wood when he was coaching the Washington Redskins. Coach Lombardi died at Georgetown University Hospital in 1970. He was being treated for colon cancer. I was so

taken by the spirit of Coach Lombardi that I was motivated to start a foundation in his name. After his death, I recruited a small group of Washington leaders, including Speaker of the House Tip O'Neill, Republican leader Bob Michael, Ned Gerrity Senior Vice President of ITT, Harold Alfond, owner of Dexter Shoe and Willie Wood, among others, to launch the foundation. Over the forty-year life of the Lombardi Foundation, we have been able to contribute over $6,000,000 to the Lombardi Cancer Center, the D.C. Boys and Girls Clubs and, today, we are helping the Retired NFL Players on a case-by-case basis with limited resources to meet their overwhelming needs. As Mike Ditka has said of his own major efforts to help them though the Gridiron Greats Assistance Fund, such private charitable efforts amount to little more than a band-aid for a large, bleeding artery that the NFL continues largely to ignore. This is an issue for the NFL and the NFLPA to work out using the ample revenues from a game that these suffering ex-players helped to build. To do anything less, which continues to be the status quo, is a moral stain upon the game itself, which this concussion issue throws into stark relief.

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Throughout his stellar career in football, and his life generally, Willie Wood always had a kind word for everyone. He never complained about the unjust treatment he certainly experienced as a black man in America and small man in a big man's game, preferring instead to excel athletically and use his remarkable skills to carve a great example of achievement others could build on in the future. Willie was never shy, however, in speaking up on behalf of a friend or anyone he

thought was being treated unjustly. On someone else's behalf, this quiet man's voice could be surprisingly loud. But now, Willie's voice is very quiet, even on their behalf. Today, then, I am honored by necessity, imperfect a vessel as I am for the task, to give voice to his concerns for his fellow retirees. Willie Wood, who suffers quietly the indignities brought on by his own injuries, wants nothing more than to see justice and equity bestowed upon his fellow NFL Retirees and has asked me, and all of us, to do whatever we can to support their cause.

Thank you for this opportunity to testify before you today.

Mr. CONYERS. Thank you, Mr. Schmidt, that was a very moving statement. I'm so glad that you're here.

Mr. SCHMIDT. Thank you.

Mr. CONYERS. George Martin is a—has been elected by the search committee going through 140 candidates to be the executive director of the NFL Alumni Association, my congratulations to you.

Mr. MARTIN. Thanks.

Mr. CONYERS. The record is another one of those kinds of records that go down in the history books. You've played with the New York Giants for 14 years, and like some of the rest of you, his commitment has led him to do things quite unusual. He's walked across the country to raise medical care for first responders in 9/11 and raised close to $3 million for those families.

I'll let you tell the rest of the—your story and the views that you bring with you after being in the game so long. Welcome to the Committee, Mr. Martin.

TESTIMONY OF GEORGE MARTIN, EXECUTIVE DIRECTOR, NFL ALUMNI ASSOCIATION

Mr. MARTIN. Thank you very much, Chairman. Again, I'd like to reiterate to Chairman Conyers it is an honor to be here, so thank you so very much. I'd like to sort of highlight some of the things that the respected Mike Ditka said, and certainly my colleague, Turk, said as well.

This marks the second such illustrious occasion in which key, high-profile, notable dignitaries from all facets of the sporting world have been summoned and assembled in order to provide valuable testimony toward the growing and mounting health issue in sports. I, myself, am once again honored to lend both my personal experience as well as sharing real-life events that have sharply added to this mounting debate. By my presence here today, it is my sincere hope that we can move closer to identifying the scope of the existing problems in all sports effecting and preventing any such future medical occurrence, and most importantly, identifying and implementing meaningful and practical solutions for those that have been adversely impacted going forward.

As a former professional athlete, I wish to reiterate once again for the record that my unique perspective lends valuable credence to the overall severity of this potentially tragic and devastating situation. As a seasoned veteran of the National Football League, 14 improbable years as a defensive lineman, I brutally toiled in the very trenches of NFL warfare delivering, as well as being the recipient of countless acts of physical depravity (sic).

I will also add that 14 NFL seasons of yesteryear, from 1975 to 1988, would actually calculate into more than one full year, more than 365 full complete days of unimaginable physicality. Realizing that what was then two a day, and sometimes three full-contact practice seasons (sic) per day, oftentimes without the benefit of a single drop of water today would constitute the very definition of insanity.

It is extremely noteworthy that the standard nomenclature of the bygone era must be properly translated for the unsuspecting public in order to fully appreciate the magnitude, and more importantly, the severity of these vitally universally accepted situations. Con-

versely, it would represent the height of naivete on my part for me to believe that I could ever adequately replicate the overall scope of afflictions that occurred during this era to you, the audience in the allotted time frame.

Nevertheless, the terms of combative engagement, drills such as 1 on 1, 3 on 3, 5 on 5, and 7 on 7 are representative events and practice segments that were devised to brutally segment, as was popular in its day, the men from the boys. These daily activities represented the epitome of physical combat or trench warfare during the course of an entire NFL season and was particularly highlighted and emphatically implemented during the NFL training camps.

Additionally, industry terms such as "bull in the ring," as well as the infamous "nut cracker" drill, were certainly not references to Spanish traditions of domestic cows running down the streets of Spain, nor a holiday ballet performances at the Lincoln Center. These signified a physical tariff measured in bloody noses and extremities, persistent headaches, broken bones, and mangled limbs. Yes, these were the immediate prices of sacrifice that I and far too many of my comrades paid in order to become, as was said earlier, modern day gladiators of the NFL, and I might add that this situation, this injurious impact was merely exacerbated on Sunday afternoons.

Now, unfortunately, a shocking day of reckoning is occurring at an alarming rate among NFL alumni, and thankfully, the world is finally taking notice. As a former NFL player representative for 12 of my 14 years, it quickly became evident to me that far too many of our predecessors were falling victim to the same sense of invincibility that we so foolishly exhibited during our earlier respective careers. However, as an NFL player rep, we cannot ignore the constant clamor for assistance in hearing grievances while filing and pursuing the necessary post career benefits.

Little did we realize their prophetic predictions and eventual medical destinations were representative of an eerily identical foreshadowing of our own futures. As they say, "Youth is, after all, wasted on the young."

The progressive need for continuous medical attention, diagnosis, and eventual treatment for former professional athletes reads like a contiguous sequential almanac. The overall situation, to coin a phrase, this is complicated. It's predictable, though, not preventable. It's treatable but not necessarily identifiable. It's pervasive, but as yet, undetermined. So it was said at that time that more study needs to be done. But little did any of us realize it then that with the passage of time, some of us would pay an even greater physical tariff for our youthful indiscretions.

As a former president of the National Football League Players' Association, with longevity, oftentimes, comes wisdom. Witnessing the deteriorating plight of the pre 1959 NFL alumni gave rise to the sense of fraternal obligation, and, thus, a collective approval was consented by players to include those warriors of yesterday era into the progressive and updated pension benefit package of the NFLPA. At that time, it was simply an act of responsibleness and good stewardship on our part as then acting players.

Now, for us, in retrospect to this day, I'd say none of us, in retrospect to this day, have ever regretted making that initial and intricate part of our marquee demands for a collective bargaining agreement. Perhaps we realized that eventually, the future would—the future fortunes would be reversed, and we would sincerely hope that history with repeat itself and that the simple act of fraternal respect and obligations would be enacted on behalf of us as NFL alumni by our successors. However, it remains a desire that is, as yet, unfulfilled.

As representative of such senior alumnis (sic), it is our hope that this Congressional action will have that desired effect. Today as the executive director of NFL Alumni Association, as one who represents a vast and diverse constituency of NFL alumni, I want to personally and wholeheartedly commend Congressman Conyers and this distinguished assembly on its noble pursuits.

Obviously, there have been careful and concise considerations to the widely diverse representatives who have been called upon to bear witness to the state of affairs regarding this issue, despite, however, the casualty of senatorial statesmen, commissioners, executive directors, doctors, and endless inconclusive data, there still remains an indeterminate impact along with insufficient data to conclusively ascertain the magnitude of this situation.

I, myself, am acutely aware of the necessary protocols and due diligence that are vital requisites in order to derive upon an accurate conclusion. However, I would humbly and respectfully add the following indelible element into our ongoing equation, and that is simple. Expedience. Expedience without sacrifice. For I represent a segment of NFL alumnis whose hourglass of hope diminishes with each passing day, and their optimism is fading as the patient has worn thin through the passage of time.

Their contribution and recognition to the success of this industry should not be cloaked in posthumous accolades, but, rather, extolled proudly, publicly, prominently while they still live. Thank you very much, sir.

[The prepared statement of Mr. Martin follows:]

PREPARED STATEMENT OF GEORGE MARTIN

Mr. George Martin

Executive Director, NFL Alumni Association

Congressional Hearing II

Chairmen Conyers,

This marks the second such illustrious occasion in which key, high profile notable dignitaries from all facets of the sporting world have been summoned and assembled in order to provide valuable testimony toward this growing and mounting health issue in sports. I, myself, am once again honored to lend both my personal experiences as well as sharing real-life events that have sharply added to this mounting debate. By my presence here today, it is my sincere hope that we can move closer to identifying the scope of existing problems in all sports, effectively preventing any such future medical occurrences and most importantly identifying and implementing meaningful and practical solutions for those that have been adversely impacted going forward.

As a Former Professional Athlete: I wish to reiterate once again for the record, that my unique perspective lends valuable credence to the overall severity of this potentially tragic and devastating situation. As a seasoned veteran of the National Football League for 14 improbable years as a defensive end, I have brutally toiled in the very trenches of NFL warfare, delivering, as well as being the recipient of countless acts of physical deprivation. I will also add that 14 NFL seasons of yester-year, from 1975-1988, would actually calculate into more the 1 full year, more than 365 full and complete days of unimaginable physicality. Realizing that what was then, Two-a-Day, and sometimes 3 "FULL CONTACT" practice sessions per day, often times without the benefit of a single drop of water would today constitute the very definition of insanity.

It is extremely noteworthy, that the standard nomenclature of this bygone era must be properly translated for the unsuspecting public, in order to fully appreciate the magnitude or more importantly the severity of these universally accepted situations. Conversely, it would represent the height of naivety on my part for me to believe that I could ever adequately replicate the overall scope of afflictions that occurred during this era to you the audience in the allotted timeframe.

Never the less, the terms of combative engagement drills such as "one on one, three on three, five on five and seven on seven," are representative events and practice segments that were devised to barbarically separate, as was popular in its day, "The Men from the boys". This daily activity represented the epitome of physical combat or thence warfare during the course of an entire NFL season, and was particularly highlighted and emphatically implemented during NFL Training Camps".

Additionally industry terms such as "Bull in the Ring", as well as the infamous "Nut-Cracker" drills are certainly not references to a Spanish tradition of domestic cows running down the streets of Spain, nor Holiday Ballet performances at Lincoln Centre. These signify a physical tariff, measured in bloody noses and extremities, persistent headaches, broken bones, and

mangled limbs. Yes, these were immediate prices of sacrifice that I, and far too many of my comrades paid in order to become modern day gladiators of the NFL, and I might add that the resulting injurious impacts were merely exacerbated on Sunday afternoons. Now, unfortunately, a shocking reckoning is occurring at an alarming rate among NFL Alumnus, and thankfully the world is finally taking notice.

As a Former NFL Player Representative for 12 years: It quickly became evident to me that far too many of our predecessors were falling victim to the same sense of invincibility that we were foolishly exhibiting early on in our respective careers. However, as an NFL player rep, you cannot ignore the constant clamor for assistance in hearing grievances, while filing for, and pursuing necessary post-career benefits. Little did we realize that their prophetic predictions and eventual medical destination, would represent an eerily identical foreshowing of our own futures. "Youth, as they say is after all, wasted on the young"

The progressive need for continuous medical attention, diagnosis and eventually treatment for former professional athletes reads like a contiguous sequential almanac. The overall situation is, to coin a phrase "Complicated". It's predictable though not preventable, treatable but not easily identifiable, pervasive but as yet, undetermined. So it was said, "That more studies needs to be done". Little did any of us realize it then, that with the passage of time, some of us would pay an even greater physical tariff for our youthful indiscretions.

As a former President of the National Football League Players Association: With longevity often times comes wisdom. Witnessing the deteriorating plight of pre 1959 NFL alumnus, gave rise to a sense of fraternal obligation, and thus a collective approval was consented by players to include those warriors of the past into a more progressive and updated pension benefit package by the NFLPA. At that time, it was simply an act of responsibleness and good stewardship on the part of us, as then, active players. None of us in retrospect to this day, have any regrets for making that initiative an intricate and a marquee demand of our collective bargaining agreement (CBA). Perhaps we realized that eventually the fortunes would be reversed, and we would sincerely hope that "History would once again repeat itself", and that a similar act of fraternal respect and obligation would be enacted on behalf of NFL Alumni by our successors. It remains a desire that is as yet, unfulfilled. As representative of such senior alumnus, it is our hope that this congressional action will have that desired effect.

Today, As Executive Director of The NFL Alumni Association and Representative of Retired NFL Players As one who represents the vast and diverse constituency of NFL Alumni, I want to personally and wholeheartedly commend Congressmen Conyers and this distinguished assembly on its noble pursuits. Obviously there has been careful and concise consideration to the widely diverse representatives who have been called upon to bear witness to the state of affairs regarding this issue. As you are aware the 2008 University of Michigan study commissioned by the NFL illuminated physical ailments currently suffered by my constituents. As Executive Director of the NFL Alumni Association I will lead the effort to work collaboratively with the league in an effort utilize the data obtained from the Michigan study to assist my constituents in need. Since being established 90 years ago, 21,000 men have played in the National Football League. Ladies and Gentlemen, I will not rest until every surviving retired

player and their families are aware of the many medical and financial programs already available to retirees. I will not rest until assistance is given to each and every retired player in need.

I myself am acutely aware of the necessary due diligence that is of vital requisite to derive workable solutions, however, I would humbly and respectfully add the following indelible element to our ongoing equation, and that is simply EXPEDIENCY.

Expedience with-out sacrifice. For I represent a segment of NFL Alumnus whose hour glass of hope diminishes with each passing day, and their optimism is fading as their patience has worn thin with the passage of time. Their contributions and recognitions to the success of the industry, should not be cloaked in posthumous accolades, but rather extolled proudly, publically and prominently while they still live.

Mr. CONYERS. Thank you very much, Mr. Martin.

Our next witness is Luther Campbell, who after a distinguished football, pro football career, has turned with great energy and competence to the training of athletes from not only football but basketball and boxing, as well, and he not only trains athletes, young ones that are up and coming, but he trains the—many of the pros in between the seasons, as well, and I've gotten to know him very

well. He's distinguished in this, the metropolitan area for his passion for young people getting the proper training and attitude to make contributions that they might not otherwise make in their life experience.

So I'm very happy to welcome him here tonight, Lu Campbell.

TESTIMONY OF LUTHER CAMPBELL,
TRAINER OF PROFESSIONAL ATHLETES

Mr. CAMPBELL. I appreciate that, Honorable Congressman John Conyers. Mr. 89. That's a personal joke.

What we've experienced here, or at least what I've experienced here today is by pure definition of the word, expostulating, to earnestly, to earnestly plead with someone, some institution about a warning that is there and that's so evident. Yes, this is a hearing technically, but it's an expostulating event that we're having and we're sharing all, one with another.

I'm a former educator in the public school system, and I have a love for the English language, I'm not a grammarian, nor a polyglot, nor a linguist, or an etymologist, but I have a love for the English language, and I always like to understand it, so when I'm in the gym, I teach. I heard the word "amyloid" used today. I use that quite frequently in the gym, and I tell the fellows—many of professional athletes were here today, eight or nine of them were sitting in the audience today, and they know—I'm sure they sat straight up in their seats when they heard that term, and they said that's what Lu gave us, and they remembered what it was, where there was a mass of protein in the brain that causes Alzheimer's disease, that's one of the first things I told them.

No, I'm not a clinician, no, I'm not a doctor, I'm a self-taught individual about the human body, and I pride myself in that. I'm sort of like the Johnny Mercer, if you will, and some of you don't know who Johnny Mercer was. Well, Johnny Mercer founded Capital Records. He sided Nat King Cole and Billie Holliday, virtually unknown but extremely productive.

I talked about—and this is not in my—in my notes. By the way, I'd like to say this. If I known it was going to be this way, I would have double-spaced and in bold-lettered and everything else so I could see what I'm doing. I can say everything is blurry at this point.

But the number one injury that I found out in the gym—and I have to digress on this, and just bear with me for a minute. The number one injury in the gym is a rotator cuff glenoid joint. The number two injury we find out is your ACL and PCL, your lateral collateral ligament, your MCL, your medial collateral ligament. Those are the things that, as late as yesterday, if we looked at the football games of the NFL, we had more collateral ACL injuries than you have anything else.

Yes, trauma to the head is paramount, yes, we have to do that, and in my testimony, you'll hear me say about that event that happened to me while playing football, but there are—there are a lot more severe injuries, and we must turn our attention to the youth. It was said that there are approximately 3.5 million youth that are engaged between the ages of 8 and 14 in contact football, a million, one million in high school football, approximately, approximately a

hundred thousand in professional football. That means arena (ph.) Football, too, and the statistics go on and on and on with this.

But I'm going to get into my written testimony, and I'll read it verbatim in here, and I'll read it rather slowly trying to discern what I've read (sic) in these late hours.

Mr. Chairman, again, I'm Luther Campbell. My moniker, my sobriquet is Big Lu, (I started my Ph.D. work in 1975 at Wayne, at this illustrious institution here, Wayne State University, "Apocope and Apheresis in the Black esoteric idiom"), and breaking that down, not trying to be too wordy for you, but understand why we as Black folk talk to each other and leave out a syllable or a letter at the end of a word: "Why did you dis' me, man?" In other words, why did you disrespect me? That was going to be my main thrust, not what they so-called Ebonics.

The title affixed to my name during the past decade is trainer of professional athletes. Among those I have helped prepare for their professional careers are Tommy Hearns, who was with me for any number of years, eight-time World Boxing champ; Chris Weber, first-round draft choice; Leon Spinks, World Boxing champ; Jalen Rose, who we see on ESPN now, first round NBA for many years; Braylon Edwards since he's been 13 years of age; Brian Westbrook, No. 1, first round NFL; Derrick Coleman, first round NFL (sic); Robert Traylor, first round NBA; Rod Hill, Dallas Cowboys; and the list continues. It's not stroking, but the list continues.

I was recruited by former Michigan All-American Mike Keller, general manager of the United States Football League, Michigan Panthers to lead our first tryout camp at Oakland University in 1982. Some of you are trying to figure out my age, I'm closer to 70 than I am to 60, now you go from there.

The late judge, Judge Peter Spivak, and former commissioner of the United States Football League, and his partner, Al Low, currently Commissioner of the Unarmed Combat Commission, State of Michigan, acclaimed me as, quote/unquote their "greatest asset" when the Panthers subsequently became world champs, excuse me, in 1983.

Joe Paterno, the incomparable head coach of Penn State University, flew to Detroit and asked me to come and lecture to his entire team on the importance of winning, as well as being and staying healthy and in shape, especially, his concern was the consumption of alcohol, and he had a very passionate concern on that and about that.

I have done both the same lectures at Tennessee State University with Joe Gilliam, Florida A&M University, Dr. Al Lawson; Columbia University up in New York right outside of Harlem, and an array of other institutions, coaches, and various individuals including many actors, singers, and politicians (notably the Honorable and most distinguished Congressman John Conyers), have been under my guidance and health concern and fitness and nutritional needs for many, many years.

My brother, Wayne Campbell, bless him——

Mr. CONYERS. If you want, Mr. Campbell, let me go to Bernie Parrish and come back to you if that would be appropriate.

Mr. CAMPBELL. I'm all right, Mr. Chairman. Thank you. My brother, Wayne Campbell, who left us several years ago, played

football with the Oakland Raiders. When Jack Tatum placed that draconian, crippling blow on Darryl Stingly, resulting in lifelong paralysis, Wayne was never the same after that. He faded out of professional football.

We must concern ourselves with the entire physicality of the game. Surely, we are absorbed with the closed-head injuries. However, if we populate the discussion with connective issues, one may, perhaps, help resolve another. We need formative discussion, not debate; resolution of issues, not dissolvement and stalemates.

The possible contributory symptoms for those players might have the following incorporated in the evaluation of the injury: Headaches, which, in my opinion, is an elementary step in diagnosing even from a trainer's standpoint, a coach's standpoint, or a health professional's observation, intellectual impairment where the player responds with practical judgment, confusion, accompanied with mild hearing loss. We did not touch on that to date. Difficulty with short-term memory, I find this especially important. All you have to do "What day is it? What time is it? Where are you? What is happening?"

These are elementary questions we should be asking the young folk as well as older folk that play this game. Drowsiness, eye problems, and focusing and clarity, personality and behavior modifications, especially in a negative manner. Problems, the youth, the coach, in discerning his opinion and delivering of transparency—bear with me—or clearness of his speech, clarity of speech, including spelling and pronunciation. Look for balance of movement, especially linear, back and forth. Walking the sidelines for five to ten yards is just one simple thing that you can do in what we call deductive reasoning.

I've trained six world boxing champions, and I want to reiterate that, six of them. I can attest to the debilitating results can occur from constant beating to the head. Muhammad Ali, one of my greatest—Muhammad Ali and I sat together at ringside in Toronto (4-26-1975) right next to each other, not at ringside but juxtaposed to each other. After George Foreman's initial fight with him, he was taunting him at ringside, and I thought I would do it, too, until George threw the chair at me, but in any event, as we discussed body punishment, both giving and taking, you'd be amazed by how much he took. Today because of who I am and what I've accomplished over these years, I'll qualify in saying that much of his physicality, his physical breakdown is and was due to constant blows to his body, as well as directly to his head.

Empirical knowledge, empirical knowledge allows me to qualify my judgment. Ali's apparent and demonstrative changes and his physical condition should have been noted earlier, and a proactive medical intervention should have taken place at that time. I know you say well, Lu, that's hindsight, 20/20, that was 1973, it should have been taken place. The individuals that are around him should have known. We talk about it in the game of football, people, your coaches, your players see those—those things happening to you in life, as with my brother and see those things happening and should have stepped in and said something about it at that point in time.

Three years prior to the Lions moving to Ford Field—I hope I didn't skip—I skipped a paragraph, I'm very sorry. All coaches

must know and certainly be credentialed, and this is very important by the way, I'm very sorry, all coaches must know and certainly be credentialed and authentically educated on what signs, conditions, and physical impairments to look for and determine what disposition is called for. You don't have to be a doctor or a clinic or a functioning clinician, just have the knowledge and coachable judgment to assess the problem and move on from there. Have a fatherly degree of empathy when a player's hurt and not so dispassionate.

The grammatical conjunction "if" always leaves us wondering what the supposition implies. Now, let's role play. What if your son was lying on the 50-yard line unconscious as a result of a legal blow? And a legal blow to the head? Stay with me on this analogy and the strategy. Tell me truthfully who would you point to? How many tears would you have? How many what ifs? Let's continue to meet, to prod, to search, to possibly research until we have some acceptable resolvement of this problem.

Three years ago, prior to the Lions moving to Ford Field, I'm sorry, that should not have been three, that should have been 8 years ago, prior to the Lions moving to Ford Field, Detroit Lions Vice-President, Larry Lee, invited me to his Silverdome office and suggested the Lions were working on bringing me on as the Lions' strength coach. That was probably based on the fact that seemingly ever year, the Lions sent me all their new players that needed to be redefined, including All-Pro William Gay, Allen Hughes, and the insidious Kerwin Waldrop, and the list continues. I met with Matt Millen immediately after that, he took charge, and he shook the shut the door in my face. Hurray for the Lions.

During preseason football in 1965, I suffered a very, very severe concussion. Years after, reflecting on my personality, disposition, and headaches, I assessed the traumatic blow. It amazes me that I have not yet recovered. 1965. This is the year 2010. I have not yet recovered. Ensuing information will show you why. One obvious factor is so overwhelming that I didn't even come full circle with it is my attention span.

Over all these years, the vision problems still come and go, and the absolute number one thing is the grinding in my neck, because when you get a very severe head problem, it has an effect on your spinal cord. That hasn't been touched on today, but I'm here to attest to that and can testify to that. And every time I turn my head, it just grinds and grinds and grinds on that axis. And I see George, you're nodding your head, so you understand.

Those are played this game and have had concussions understand that. Not only do I have firsthand testimony but empathetic transference of knowledge to those who have suffered. There's not much someone can offer me in terms of injury and how the injury feels or occurs, but how I can chronicle it and you can possibly learn from me and certainly, it should not happen on your watch.

The game is violent, and the rules are adjusted and modified yearly. Penalties, again, are regulated along with other obligatory changes. They feel it's necessary to change this and change that if it's necessary to look good on paper. However, injuries haven't abated. Perhaps revising the design and materials of football helmets. Having all equipment modified, research analysis on com-

position, absorption, and possibly buoyancy of the field, making orthopaedists and neurologists mandatory, mandatory on staff would address some of the problems. The caveat, however, when you make them mandatory, is to get the doctors to engage themselves more objectively about the player's condition instead of possibly thinking subjectively, meaning fix you up, put you in to win.

Articles on my ability have been listed in several local papers, Detroit Free Press, Detroit News, and Michigan Chronicle on 48 occasions, and numerous times on electronic media. Perhaps one that has received more international attention appeared on the front page of the Detroit News and subsequently took up four pages to explain on how I took all 544 pounds, I'll repeat that, 544 pounds off of three individuals in less than 6 months. That was Tuesday, March 30th, 1999, pages 1F, 6F, 7 and 8F in the Detroit News.

Just the opposite, I put muscle mass on naturally, I'm a vegetarian. I've been a vegetarian for 35 years, and thus believe in a more natural wholistic approach to the human body. I don't smoke. I don't drink. I won't and don't approve of it being used, especially by athletes. As an example, the Detroit News Health and Fitness Magazine, front page again, Wednesday, December 22, 2001, section 8, headlines, "How he built his body, Novi Man Goings From Skinny 144 pounds at age 18 to 210 Pounds of Pure Muscle," (A Gain of 66 Pounds Under the Training of Big Lu).

A subsequent story appears in Men's Fitness magazine. October 2004, page 64-66, the Oakland—the current—the current, as we sit here today, the current center at Oakland University, Keith Benson was sent to me as a high school junior by Chris Weber's brother. It doesn't say that in here, but that's who sent him. His six-eleven frame, please imagine this if you close our eyes, or keep them open, whatever your pleasure is, he's 6'11" and 172 pounds. I'll let you soak that in for a minute.

It had to be a dramatic change that was getting ready to happen. Keith didn't start as a junior and rarely played as a senior at Country Day. He listened, came to the gym and listened to me, bought into my abilities, and last week, last week was projected as an NBA first-round draft choice, minimum signing, $40 million. Over the years, I've trained seven Mr. Basketballs here in the state of Michigan, Robert "Tractor" Traylor, who I took 48 pounds off of, Willie Mitchell, Mike Tally, who appeared in today's paper, led Michigan basketball to three State championships at Cooley High School, and his son right is in the papers of All-American Basketball. Chris Webber, Derrick Nix of—starting center at Michigan State, Dion Harris, Winfred Walton who was placed above Kobe Bryant when he came out of high school, as well as Miss Basketball, Maxanne Reese, and I'm currently training Nick Perry, 2001 at USC, and if you saw the high school All-American game last night, William Gholston, who was most valuable, 2009, he's headed for Michigan State, both Mr. Footballs, and a plethora of unheralded other athletes.

This fall, and I will conclude it with this one, this my favorite and this is that touches me, I hope my son is still here, he's the tall, good looking gentleman back in the back. This fall, my grandson, Jayru Campbell, age 13, led the P.A.L. Westside Steelers to a perfect season, undefeated, and unscored on regular season play,

during the championship game at Ford Field, November 14, 2009, Jayru threw three touchdown passes. He was named MVP of the game. In 5 years, he has never lost a game as a starter.

The Steelers are the same team with the same coaches as Devin Gardner, University of Michigan No. 1 recruit quarterback. The Detroit Free Press this past Tuesday, December 29, 2009, page 2B, quote: "ESPN Scouts, Inc., National Recruiting Director Tom Luginbill said "Devin has been far more prepared in the passing game and playing in a scheme that has required him to do some things with his arm on a more—much more consistent basis than Terrelle Pryor, who's the current quarterback at Ohio State, ever was. I write this because Jayru came up just one TD short of Devin's record. Devin had 18.

My son Shawn, who again is sitting in back, the good looking tall one, Jayru's father, ex-pro basketball player, 6'8, 242 pounds, and of course, I am 6'6 at 278. I talked to Jayru about it, I said 'Ru—I call him 'Ru, I said Jayru, what is your genetic projection? Your genetic projection at age 17 will be 6'7, possibly 250 pounds. Imagine that.

He hasn't had any head injuries because Shawn made sure that he has incorporated special training and education, especially with technique tackling, and I'm ending this now, and I'm sorry to be so long with this. Shawn will not allow him to lead with his head. I will repeat that. Shawn won't allow Jayru to lead with his head. He also wears the proper and best helmets. Now you see why I'm overly involved in this direct attention bringing to football players and the whole conference on head injuries to a climax today. I plan to see Jayru through until his name is called as the No. 1 draft choice in the NFL. By the way, he averages 20 points in basketball, also league MVP, and he maintains a 3.4 GP or better, and I won't continue this. I'll leave it at that point. [Applause.]

[The prepared statement of Mr. Campbell follows:]

PREPARED STATEMENT OF LUTHER CAMPBELL

CONGRESSMAN JOHN CONYERS, JR.

Chairman, U.S. House Judiciary Committee

Michigan's 14th District Representative and Dean of the Congressional Black Caucus

Luther "BIG LU" Campbell

Trainer of Professional Athletes

Detroit, Michigan

(313) 345-1401

House Judiciary Committee Chairman field hearing in Detroit, Michigan on "Legal Issues Relating to Football Head Injuries, Part II."

Monday, January 4, 2010, 1:00 P.M.

Wayne State University School of Medicine

Gordon H. Scott Hall, Room 1460

540 E. Canfield St., Detroit, MI

Mr. Chairman, I'm Luther Campbell. My moniker is "BIG LU", (started PhD. in 1975 @ Wayne State University, "Apocope and Apheresis in the black esoteric idiom"). The title affixed to my name for the past few decades is "Trainer of Professional Athletes". Among those I have helped prepare for their professional careers are: Tommy Hearns (8 time WBA boxing champ); Chris Webber (1st round NBA); Leon Spinks (world boxing champ); Jalen Rose (1st round NBA); Braylon Edwards (1st round NFL); Brian Westbrook (1st round NFL "Lions"); Derrick Coleman (1st round NBA); Robert Traylor (1st round NBA); Rod Hill (1st round NFL "Cowboys"); and the list continues.

I was recruited by former Michigan All-American, Mike Keller, General Manager of the United States Football League, "Michigan Panthers", to lead the first tryout camp at Oakland University in 1982. The late Judge Peter Spivak, former Commissioner of the USFL, and his partner Al Low, current Commissioner of the Unarmed Combat Commission, State of Michigan, acclaimed me as their "greatest asset" when the Panthers subsequently became world champs in 1983.

Joe Paterno, the incomparable head coach of Penn State University, came to Detroit and asked me to lecture his entire team on the importance of being (and staying) healthy, especially concerning alcohol consumption. I have done the same types of lectures at Tennessee State University, Coach Joe Gilliam; Florida A & M University, Dr. Al Lawson; Columbia University, and an array of institutions, coaches, and various individuals including actors, singers, and politicians (notably the honorable and most distinguished Congressman John Conyers), have been under my guidance concerning health, fitness, and nutritional needs.

My brother, Wayne Campbell, who left us several years ago, played football with the Oakland Raiders. When Jack Tatum placed that draconian, crippling blow on Daryl Stingly, resulting in lifelong paralysis, Wayne was never the same... he faded out of professional football. We must concern ourselves with the entire physicality of the game. Surely we are absorbed with closed head injuries; however, if we populate the discussion with connective issues, one may perhaps help resolve another. We need formative discussions and not debate, resolution of issues not dissolvement and stalemate.

The possible contributory symptoms for these players might have the following incorporated in the evaluation of the injury: Headache, which in my opinion is an elementary step in diagnosing even from a trainer's, coach, or health professional's observation; Intellectual impairment, where the player has problems with practical judgment; Confusion, accompanied with mild hearing loss; Difficulty with short term memory (I find this especially important—"What day is it?" "Where are you?" "What happened?"); Drowsiness; Eye problems (in focusing and clarity); Personality and behavior modification (especially in a negative manner); Problems with you, the coach, in discerning his oration and delivery of transparency

or clearness of his speech, including stumbling and pronunciation; Look for balance of movement (especially linear), have him walk a sideline for 5 to 10 yards (Just note simple deductive reasoning).

I've trained six world boxing champs, and can attest to the debilitating results that can occur from constant beating to the head. Muhammad Ali and I sat together at ringside in Toronto (4-26-1975) after his fight with George Foreman. As we discussed body punishment, both given and taken, he amazed me at how much he took. Today, because of who I am and what I've accomplished over these years, I feel qualifed in saying that much of his physical breakdown is and was due to constant blows to the body as well as directly to his head. Empirical knowledge allows me to qualify my judgement. Ali's apparent and demonstrative changes in his physical condition should have lead to some earlier proactive medical intervention.

All coaches must know and certainly be credentialed and/or clinically educated on what signs, conditions, and physical impairments to look for and determine what disposition is called for. You don't have to be a doctor or functioning clinician, just have the knowledge and coachable judgement to assess the problem and move on from there. Have a fatherly degree of empathy when a player is hurt and not so dispassionate. The gramatical conjunction "IF" always leaves us wondering what the supposition implies. Now, let's role play: What "IF" your son was lying on the 50 yard line, unconscious as a result of a "legal" blow to the head? Stay with me on this analogy; tell me truthfully who would you point to? How many tears? How many "What If's"? Let's continue to meet, prod, search, and possibly research until we have some acceptable resolvement.

Three years prior to the Lions moving to Ford Field, Detroit Lions Vice President, Larry Lee, invited me to his Silverdome office and suggested the Lions were working on bringing me on board as their strength coach. This was partly based on the fact that seemingly every year I was sent some of their players who needed to be re-defined; including All-Pro William Gay to Allen Hughes, and the insidious Kerwin Waldrop and the list continues. I met with Matt Millen days after he took charge, and he shut the door on my involvement.

During pre-season football in August 1965, I suffered a very, very serious concussion. Years later after reflecting on my personality, and disposition with headaches, I assessed the traumatic blow. It amazes me that I have not yet "recovered". One obvious factor that is so overwhelming is that I didn't ever come full circle with my attention span. The vision problems still come and go, and the grinding in my neck every time I turn is still there. Not only do I have first hand testimony, but empathetic transference of knowledge to those who have suffered. There's not much one can offer me in terms of how the injury occurs or how it feels, however, I can chronicle what you might possibly be in store for if it happens on your watch.

The game is violent and the rules are adjusted and modified yearly. Penalties, again, are regulated along with other "obligatory changes", however, injuries haven't abated. Perhaps revisiting the design and materials of football helmets; having all equipment modified; research analysis of field composition (absorption, and possibly buoyancy); making orthopedists and neurologists mandatory on staff would address some of the problems. The caveat is to get the doctors to engage themselves more objectively about the player's condition, instead of possibly thinking subjectively, meaning team first -"Fix you up .... Put you in – to win" attitude.

Articles on my abilities have been listed in our local papers THE DETROIT FREE PRESS; THE DETROIT NEWS and MICHIGAN CHRONICLE on 48 occasions and numerous times on our various electronic media.....Perhaps one that received more international attention started on the front page of our DETROIT NEWS and subsequently took four pages to explain on how I took **544 lbs.** off three individuals in less than six months (Tuesday, March 30, 1999/pages 1F, 6F, 7 & 8F).

Just the opposite, I've put muscle mass on----naturally. I'm a vegetarian and thus believe in a more natural and holistic approach to the human body. I don't smoke or drink and won't and don't approve of either being used-----especially by athletes. As an example, THE DETROIT NEWS, Health and Fitness magazine , front page, (Wednesday, December 12, 2001 section H), headline "How he Builds His Body, Novi man goes from skinny 144 pounds at age 18 to 210 pounds of pure muscle at 21." (a gain of 66 pounds under the training of "BIG LU"). A subsequent story appears in MEN'S FITNESS magazine October 2004, pages 64 – 66. The current center at Oakland University, Keith Benson, was sent to me as a high school junior. His 6'11" frame at 172 lbs. was going to be a dramatic challenge. Keith didn't start, and rarely played as a junior at Detroit Country Day. He listened to me, trusted in my abilities, and last week (as a junior) was projected to be an NBA 1st round draft choice.

Over the years, I've trained 7 "Mr. Basketball"s, Robert "Tractor" Traylor (whom I took 48 pounds of fat from), Willie Mitchell, Mike Talley, Chris Webber, Derrick Nix, Dion Harris, and Winfred Walton; as well as a "Miss Basketball", Maxanne Reese. I am currently training, Nick Perry 2007 (USC) and William Gholston 2009 (headed for Michigan State University) both "Mr. Football"s....and a plethora of other super unheraled athletes.

This fall, my grandson, Jayru Campbell (age 13), lead the P.A.L. "Westside Steelers" to a perfect season, undefeated and unscored on in regular season play. During the championship game at Ford Field, November 14, 2009, Jayru passed for 3 touchdowns. He was named the MVP of the game. In 5 years ------- he never lost a game as a starter. The "Steelers" are the same team, with the same coaches, as **Devin Gardner** (University of Michigan's #1 recruit at quarterback). THE DETROIT FREE PRESS Tuesday, December 29, 2009, page 2B "ESPN scouts

inc. national recruiting director Tom Luginbill 'Devin has been far more prepared in the passing game and playing in a scheme that has required him to do some things with his arm on a much more consistent basis than Terrelle Pryor ever was"..... I write this because Jayru came up just one TD short of Devin's record for a season, Devin had 18.

My son, Shawn Campbell (Jayru's father, ex-pro basketballer @ 6'8", 242 lbs. and I'm 6'6" @ 278 lbs.; Jayru's genetic projection @ 17 yrs. is 6'7" and possibly 250 lbs.), said he hasn't had any head injuries because he has incorporated special training, and education, especially with technique tackling. Shawn won't allow him to lead with his head. He also wears the proper and best helmet. Now you see why I am overly involved in this direction in bringing attention to football players and closed head injuries. I plan to see Jayru through until his name is called as a #1 round draft choice.....by the way, he averages 20 points in basketball, he's also the league's MVP, and he has to maintain a 3.4 GPA or better.

Our cerebellum controls balance and is part of our brain. The coaching staff should have approval in some accredited area of academic training as it relates to this issue. Progressive deterioration of mental (and recall) functions.....subtle or acute changes should be observed and known by the coaches and of course proactive engagement started. All of the above information was, has, and will always be part of my concern as a trainer, coach, former athlete, mentor, and parent. The wellness of our players is indisputable.

Mr. CONYERS. Well, thank you.

Mr. COHEN. There's a spot at the University of Memphis for him, I'll offer him the scholarship here.

Mr. CAMPBELL. That's his daddy over there.

Mr. MARTIN. I must take my leave, sir.

Thank you.

Mr. CONYERS. We close with Bernie Parrish, and I think appropriately so. He's the author of a best selling book "They Call It A

Game," about the economics and politics of the NFL, and he has the distinction of being named an All-American in both basketball and football.

Mr. PARRISH. Baseball.

Mr. CONYERS. Oh, in baseball, I'm sorry, and I'm delighted that you had the staying power to be with us and close us out. Thank you very much.

TESTIMONY OF BERNIE PARRISH, RETIRED NFL PLAYER

Mr. PARRISH. Thank you very much for having me here, and I'm, well, a fan of yours, Chairperson Conyers, and I particularly want to thank you for being here, Mr. Cohen, and Linda Sánchez is just terrific. She's been a wonderful advocate for us, and we got to give credit to Maxine—Representative Maxine Waters, who has been our angel, and Sheila Jackson Lee, as well, from Houston, who has been a great asset and a great advocate for us, and I want to thank Alan Schwarz, whether he's here or not, for the articles that have moved this ahead, and I haven't always agreed with everything he's written, but he's done a terrific job. So he deserves credit for it.

I did—I wrote They Call It A Game some decades ago, and the subtitle of it is An Indictment of the Pro Football Establishment, How It Manipulates and Protects It's Billion Dollar Monopoly At the Expense of the Players and the Public. It was 1971 when I published that, and nothing's changed except the numbers are bigger.

This hearing sort of reminds me of the Watergate era. I—I—and two of my other personal heros, Senator Sam Ervin and Senator Philip Hart, and I was fortunate enough to meet those two political giants at a hearing much like this one, focused on the NFL and abuses of their antitrust exemptions, and here's what—here's what Senator Ervin had to say at that hearing: "Mr. President, I shall vote against the bill for two reasons. First, the bill makes it lawful for persons who operate professional football clubs to do things for which other Americans are to be subjected to damages, fines, or imprisoned. Second, the bill makes every person in America who possesses skill in a athletic career the economic slave of those who are engaged in these sports on a professional basis for commercial gain."

The wheels turn slowly. This yellowed copy of the Congressional record is from August 31, 1965. That's what Senator Sam had to say, and I was at that hearing, so I've been—I've been at this a long time. I'm as yellow as the book, probably, at 73.

In 1976, there was another hearing, and I won't bore you with this but this is my statement to the Subcommittee on Antitrust and Monopoly of the United States Senate in 1976, and I can make it available if you——

Mr. CONYERS. We'll accept it into the record and return it to you.

Mr. PARRISH. One of the reasons that I really was so happy that you had this in Detroit is my brother is—teaches here at Wayne State as a political science professor. He helped edit that book, and he is head of the teacher's union here at Wayne State. So I'm—I'm very happy to get to spend some time with him, too.

You know, when I got here and I heard that first panel, I thought I had come to the wrong room and that I was at a tobacco

industry hearing where the tobacco industry spokespersons, the doctors, the experts that they created were here talking on their behalf, and actually, the NFL uses the same merchants-of-death business model as the tobacco industries do, and it was—has created a tobacco council just the way Covington & Burling who represent the NFL today represented Philip Morris and the other tobacco companies when they set up the tobacco council.

This mild traumatic brain injury committee is the sequel to the tobacco council which produced its own bogus studies, paid experts to testify that tobacco products do not cause cancer, and it exactly parallels the way that Covington & Burling partnered Paul Tagliabue, who was commissioner of the NFL, set up and created the NFL's Mild Traumatic Injury Committee.

He named the first chairman, Elliott Pellman, who was his personal physician and a graduate of Guadalajara's Medical School in Rheumatology, who had absolutely no expertise on brain injuries, was forced to resign when he testified at the steroid hearings for baseball. The New York Times then exposed him as having padded his resum and not being an expert on steroids anymore than he was an expert on concussions. But he had to step down.

He resigned just as these two fellows, Casson and Viano, had resigned but remained on the payroll. In fact, he—Mr. Pellman is described as the—NFL's liaison for Commissioner Goodell, so he gets all of his information on—oh, the concussions through this filter of Pellman today. The people—the Dr. No here, Dr. Casson was, you know, telling us about the progress they had made. Well, the neurological training physicians on the sidelines, and now, we're, you know—they were—they are being selected by Dr. Pellman and Dr. Mayer, who is the expert, who's the medical expert from the NFLPA, and Dr. Pellman have selected those particular doctors to be on the sidelines.

Well, I'm—Mr. Mayer doesn't have anymore brain injury training or expertise than Mr. Pellman does. So we're, you know, we're kind of—keep going back to square one, and I keep going back—it takes me right back to the tobacco industry, the way they sold the fact that using tobacco products doesn't cause cancer, playing professional football doesn't cause dementia eventually, etcetera. And the idea that the—they have perfected deny—the delay and deny process, delay, delay, study it, study it to death, and make magnanimous statements about what they're going to do, etcetera, etcetera, wind up denying.

We've sort of gotten the mild brain trauma committee mixed up with the retirement board. It is the retirement board that turns down all of the disabled fellows who apply for disability and get turned down, and that is composed of three players and three owners' representatives, and the commissioner of the National Football League, who doesn't get his due credit for being the chairman of that committee that Mike—I was interested in hearing Dr. Maroon's testimony about concussions, and then after it was over, I asked him if he was Mike Webster's doctor ever since he was the team doctor for the Steelers. He said yes.

Well, the appeals court said that the—that the NFL had abused its discretion when it had turned down Mike Webster, and the appellate court approved him and approved—or disapproved turning

him down, and he won. He finally won, like, a million and a half dollars and which is certainly not due compensation for what he went through, and his son Garret is here, and I'm sure he can assure you of that. But it is—it was a—not just a very sad event, but far too typical of what has gone on in the National Football League, and it ought—and the thing is you have to relate it back to the operation of the league, and the—if there has ever been an example of medical—oh, medical fraud and abuse, it is the disapproval of so many disabled players. That money has to come from somewhere when they are disabled, and they have to be treated, anyway, and that comes from Medicare, Social Security, and Medicaid, and if that's not medical fraud and abuse, I don't know what is.

They do it by hiring doctors and experts who will make the denials that are needed in order for them to keep their money in their pocket, the same way that the tobacco industry does it. I'm—I heard so many—you know, look, what can Congress do it about it? Okay? You've been at this thing since at least 1965, but it's still—you know, we're still at it. You know, what in the hell can we do?

I heard so many times Gene Upshaw repeat that retired players are not in the bargaining union, the union, the NFLPA, does not represent retired players. Well, actually, nobody represents retired players. Mr. Martin does not represent retired players. That's—that's—the NFL alumni is a hoax being perpetrated by Roger Goodell in order to make it appear that the retired players have a representative. There are less than a hundred players in the NFL alumni, less than a hundred retired players. They don't represent diddly in the—in the overall scheme of things.

Now, I had had an interesting go-around with Gerald Toner, who is the chief of labor racketeering for the Department of Justice, and in the mid-term elections in 2006, I got a 32-page e-mail from Mr. Toner apologizing and—for holding my complaints to him about the NFLPA and the NFL since June of the—of that year, and he waited until the elections had been determined that the Democrats had carried both houses, the House and the Senate, and then sends me this 32-page e-mail saying sorry, but—sorry, but I'm separating these, whoever—Mrs. Elizabeth Bond's labor department, well, Liz Bond has danced this around already for 2 years before he sent it to her, and his conclusion to me was you need to get a lawyer and sue him, so I did. And I won $28.1 million for—for 2000 players who supported me.

There really were more players involved, but they—there—the scheme was devised by my—our lawyers and the NFLPA lawyers, and the judge, in order to—to minimize the damages you had to, in order to be included in the lawsuit, you had to have signed what was called a group licensing agreement, and only a certain number of guys even had an opportunity to sign it. They—there were 2,062, according to what the NFLPA produced in the way of records there, we actually know that there were many more than that, but there—at least over 3,000, but they produced 2,062, which minimized the damages, and we—but we wound up—we are now in the process of settling this lawsuit for $26.25 million, and in this process of settling we've—we had—we gave up our attorney and our class representative gave up the rights to sue Electronic Arts Video Games, which were using our images without paying us anything,

Magna Video Games, who collected over $130 million of royalties and paid us nothing, and there are 80 other vendors who are included, and—and our guys, our lawyers, and Herb Adderley, who is your class representative, gave up the rights to those.

So since I'm the only one who reads any of the case stuff, I found out that wait a minute, you know, they can't do that. So I sent out an e-mail to all—all around 1800 retired players that I stay in contact with, and the judge reversed that, he threw that part of the—of the settlement out and changed wording, and so now we can sue VA, and Madden, and these are—it was a $300 million giveaway had we not found it and the judge not responded it to it. Thank God the judge responded to it.

But now I'm sorry that DeMaurice Smith wasn't here because he was the other side of the 300 million. He—he and our attorneys made the deal, and we were—we were screwed temporarily for 300 million so—but that is—is a—is the way—that's the sort of business that we have faced for years and years, and we need your help.

We need Congress to do some things for us. Now you have—well, I won't say you, but government, the NLRB made a ruling that the—that the retired players could not be represented by the union. You have—so you have no vote in the union.

[The prepared statement of Mr. Parrish follows:]

PREPARED STATEMENT OF BERNIE PARRISH

Statement of Bernie Parrish

Former NFL player, author of the best selling book
They Call It A Game and a new book
Delay and Deny due to be published in 2010

My book, *They Call It A Game*, published decades ago, *had the* subtitle, ***"An indictment of the pro football establishment: how it manipulates and protects its billion-dollar monopoly at the expense of the players and the public."*** The only change through the years has been that the numbers are bigger.

I thank the Committee on the Judiciary, especially Chairman John Conyers, for holding this hearing. It reminds me of the Watergate era and two of my personal heroes, Senator Sam Ervin and Senator Phillip Hart. I was fortunate enough to met those political giants at a hearing , much like this one It focused on the NFL and abuses of anti-trust exemptions.

Here is what Senator Ervin had to say about the NFL's arrogant, illicit operation :

> "Mr. President, I shall vote against the bill for two reasons. First, the bill makes it lawful for persons who operate professional ...football...clubs to do things for which other Americans are to be subjected to damages, fines, or imprisonment.
> Second, the bill makes every person in America who possesses skill in an athletic career the economic slave of those who are engaged in these sports on a professional basis for commercial gain. Senator Sam said this in 1965.

The NFL's approach is to perfect its Delay and Deny program following the tobacco industry's "Merchants of death business model". The NFL even uses the same law firm as the tobacco industry uses, Covington & Burling, the law firm who created the "Tobacco Council" to produce bogus studies and paid experts to testify that tobacco products does not cause cancer. It exactly parallels the way Covington & Burling partner, Paul Tagliabue, who as Commissioner of the NFL, created the "NFL's Mild Traumatic Brain Injury Committee." It functions as did the Tobacco Council, functioning to create a smoke screen of studies and organizing experts to deny that professional football causes concussions that lead to further complications, including early dementia. Taglibue installed Dr. Elliot Pellman, a graduate of Guadalajara's medical school in rheumatology. Pellman had no expertise whatsoever in brain injuries, mild or otherwise, as the MTBI Committee Chairman. *The New York Times* exposed Dr.. Pellman's padded resume and he subsequently resigned as chairman of the NFL MTBI Committee. However Dr. Pellman remains current NFL Commissioner Roger Goodell's filtered conduit of information on concussions and brain injuries from the MTBI Committee. Dr. Pellman has authored some 13 suspect studies on concussions and brain injuries and these have likely had an impact on youth football programs with possible life-threatening effects made more dangerous because of their tacit endorsement by the NFL.

After 50 plus years of professional football the NFL Commissioner and its players union have suddenly awakened and decided it is time to study the problem for a few more years or buy off

those they can and try to discredit those they cannot, at least until the media heat cools off. The NFLPA has been complicit and negligent on its own regarding player's injuries in general but especially about concussions and brain injuries. The NFLPA's Dr. Thom Mayer was employed part time being paid less than $25,000 a year until I pointed out that you can't get much medical expertise for what they were paying Dr. Mayer. That email got him a big raise and now I understand he is the NFLPA's concussion expert, without brain injury portfolio. But the Delay and Deny program is carried out in large part by the players Gene Upshaw appointed representatives on the Bert Bell Pete Rozelle NFL Player Retirement Board. They include Tom Condon (a player's agent who also represented the late Gene Upshaw), Dave Duerson (a former NFL player and bankrupt business man crony of the late Gene Upshaw), and Jeff Van Note (an announcer for the Atlanta Falcons). This board made up of these three former players and three owner's board members plus Commissioner Roger Goodell were found by an appellant court to have "abused their discretion" in the Mike Webster case and are responsible for the many widely believed unjustified denials of disability claims.

Only four retired players were receiving disability for brain injuries at the time of the last Congressional hearings that is four out of 13,000 former NFL players. Only 317 total retired players out of 13,000 (now Goodell says 21,000 have played in the NFL so it is four and 317 out of 21,000) received disability for their football injuries but that number was moved up to 428 a couple months later when the Congressional Research Service (CRS) report was being compiled.

Facts and figures do not stand in the way of NFL spokesmen trying to convince the public or congress that the owners are generous to a fault. The recent NFL funded University of Michigan study of retired player circumstances says 86% of the older retired players own their own home and 92% have Medical insurance. There is no group in America unless it is highly selected that is made up of people 86% of who own their own home and 92% who have medical insurance (other than the publicly funded Medicare). Those numbers cited by the NFL are suspect as their speaking in percentages when the numbers are pitifully low when for instance a 25% benefit increase equals $1.63 a day.

How reliable can any of that NFL telephone study of retired players be? Talking in percentages allows them to tout the $1.63 a day increase to our pensions as a 25% increase, but it only shows how pitifully low the sub-poverty level actual pensions are. No announcement was made about Gene Upshaw's simultaneous $10,000 **per day** compensation increase at about the same time. Our average pre 1982 pensions remain below poverty level. Goodell's PR gang deliberately make confusing statements that lead your committees and the public to believe the pre 1993 retired players receive the same benefits as today's players, which they should but don't.

Chairman Conyers, I applaud you for taking on this daunting task and risking the ire of the over privileged political contributors who own and operate the NFL. You have been a hero of mine for many years, and that continues today. This problem is not an easy one, and it cannot easily be separated from our Bert Bell/Pete Rozelle NFL player Retirement Plan because the owners have chosen to use our pension plan as their medical insurance, our/their player disability plan. When no medical insurance company would cover their business, because football is too risky and injuries too frequent and severe to bet against, the owners had to come up with a different insurance plan, so they made it part of our player retirement (pension) plan. This created a

competition between retirement and disability payments. The more and higher the disability payments the lower the amount available for pensions.

I was advised by your staff not to go into the pension and disability issues in my testimony, but to stick to the concussion and brain injury problems. When you know the whole story that is impossible to do.

Dealing with the NFL and NFLPA's collusive Delay and Deny operations means battling through their myriad of tobacco company type public relations stunts, phony expert's denials, purchased testimony, and illusions of representation. It means fighting their multi-million-dollar lobbying efforts directed against retired players and the public. They want you to keep your attention on new understanding of retired player issues, speeding up the administrative institutional process, the 88 Plan; which is a cheap out of court settlement for brain damage caused by playing football, retired player families are often so happy to get any help they are reluctant to say anything that might anger the tight-fisted owners who operate these public relations scams. Look at the shiny object I'm holding up in this hand while I pick you pockets with process, and procedure, and studies, and investigations and already taking care of that, talking to the NFLPA about that, talking to Dr. No (Ira Cassen) about that, that has to wait for the next Collective Bargaining Agreement, that has to wait, to wait, to wait, to wait, wait, wait, Delay until we can Deny...

John Updyke once said, "It is difficult to make some one understand when his salary depends on him not understanding." Like Roger Goodell, his staff and his bosses Covington & Burling led legal team.

After the June 2007 Congressional hearings Miki Yaris-Davis, Director of Benefits for the NFLPA, described seeing the retired players together is like watching a bunch of Maryland crabs scuttling along, "They're all injured, it's just a matter of degree."

The NFL's Delay and Deny program pushes the costs of concussions and NFL injury caused early dementia on Medicare, Social Security and Medicaid amounts to medical fraud and abuse operation that has kept billions of dollars in the NFL owner's bank accounts that should have been paid out by NFL owners for the medical treatment of their employees injuries sustained playing in the NFL.

The NLRB has ruled the retired players are cannot be part of the NFLPA's bargaining unit, therefore it is fair to say Congress has left us with no way to protect our interests except through litigation. Congress could correct this with legislation giving retired players a vote making retired players an equal voting part of the bargaining unit

As Gene Upshaw repeated many times retired players are not in the bargaining unit, The NFLPA, the (union) does not represent retired NFL players. The "new" NFL Alumni Assoc is a hoax, another illusion of representation being perpetrated on retired players by Commissioner Roger Goodell. He is using a small group of former players, his favored courtiers to try to install a clone of Gene Upshaw in a position to block retired players for Goodell and his masters. These courtiers collect various personal favors while helping Goodell carry out some rather clumsy

amateurish Divide and Conquer strategies to keep from dealing with the key issues.

Congress needs to insure that:

1) There is an Increase in the NFL retirement to match that of Baseball;
2) NFL Disability plan is rewritten to deal with the unique problems of professional football including concussions and all brain injury problems related playing NFL football;
3) There is a one time reparations payment to the players who played under the most dangerous helmet to helmet crack back, cut block, clothes lineing crack back, head slap rules, suffering concussions, neck and spine injuries playing with inferior equipment who established the NFL as America's foremost sport, now an $8 billion a year sport's business.
4) That the Office of Safety and Health Administration (OSHA) has jurisdiction to oversee the operation of the NFL.
5) That the study of concussions and brain injuries in sports is overseen by the National Institutes of Health (NIH).

Anyone who joins the Goodell-Martin NFL Alumni Association looking for representation is being foolish.

On the morning of the 2006 midterm elections at 10:01 AM it was confirmed that the Democrats had gained control of both the Senate and the House. At 10:30 AM I received a 32 page email from Mr. Gerald Toner, Chief of Labor Racketeering, apologizing for holding my complaints about the NFL and NFLPA since June 2006 then telling me I had not specifically cited the laws violated therefore he was forwarding my complaints to Elizabeth Bond in the Department of Labor and Toner then told me I should get a lawyer and sue the NFLPA. I did and won $28.1 million for over 2000 retired players who backed me that this two-year ordeal. Legal maneuvering and the usual lawyer deal making, coupled with the usual NFL NFLPA type collusion unfairly cut another 11,000 retired players out of the case in what I believe to be a flawed trial followed by a very tainted trial settlement deal. Ms Bond has already been dancing us around for several frustrating years on the labor violations before I complained to Mr. Toner.

I worked for months helping to draft the bill to rescind the NFL's shield behind which they hide their misdeeds and abuse of retired players and the public. The draft bill was attached to my October 26, 2009 statement to this Committee and includes most of my suggestions intertwined with others ideas on how to write such a bill. The American Needle case pending before the United States Supreme Court is the most important case to the players and the public ever. Eric Holder defended the NFL and won this case when he was at Covington & Burling. Now the Solicitor General is calling for it to be remanded to the lower appellant court that ruled originally in the Holder's old NFL client's favor. Of course, Mr. Holder should remove himself from asserting any influence in the American Needle v. NFL case.

For more detailed information on disability and other retired player issues go to Dave Pear.com website it has a library of information and adds commentary from all sides to it daily.

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Mr. COHEN. Mr. Chairman, may I have the floor for a moment.

Mr. CONYERS. Yes.

Mr. COHEN. Mr. Parrish, I skimmed your book, and I appreciate your references, but were you here for the testimony earlier by Dr. No and Dr. Yes.

Mr. PARRISH. Yes, I was.

Mr. COHEN. Is that a proper synopsis of your evaluation of their testimonies.

Mr. PARRISH. I have never heard more P.R. B.S. In my life. It was absurd. Is this—I understand from—from Linda, Representative Sánchez, that you cannot lie with this Committee even though you didn't swear us in, you still can't lie to the Committee, it is still perjury; is that correct?[No verbal response.]

Mr. PARRISH. Well, there was a lot of lying going on, fellas.

Mr. CONYERS. Well, that's why we have transcripts.

Mr. COHEN. If you don't mind, Mr. Parrish, for a second, I'd like to ask Dr. Benson and Dr. Kutcher did you find anything that Dr. Casson said that you all agreed with? In essence, the bulk of his testimony that there's not any reasonable scientific foundation to the beliefs that concussions cause dementia or other type of brain damage, there's not sound evidence at this time, do you concur in that, or do you find that to be a little bit——

Dr. BENSON. Ridiculous.

Mr. COHEN [continuing]. Yeah, that's a nice——

Dr. BENSON. Yeah, I think that it's easy in medicine and science to wait for absolutes. There are no absolutes, though, in what we do. I think Dr. Omalu said it right. You know, our first priority is—is the welfare of the citizenry, in this case, the athletes and to wait for absolute truth, and I'm not sure he really addressed that question that Congressman Sánchez posed, which was why the difference between the studies on the boxers, with 17, I think was the number that he throughout, versus what Boston U has, for instance.

So I think every point he refuted, negated, turned around the question, and I think that it's—I think it's common sense that playing football causes brain injuries. I showed you a movie showing you with just normal movement how much movement there is of the brain within the cranium. So it's not a stretch, and, you know, frankly, I—I think it was somewhat a waste of time, the questioning, because I think we all knew what Dr. Casson was going to respond with. I think we need to remove on, get past that, and——

Mr. COHEN. So if I can synthesize your response, you don't to be a brain surgeon to figure this out.

Dr. BENSON. Or a brain scientist.

Mr. COHEN. Dr. Kutcher, what's your thought about that testimony.

Dr. KUTCHER. I would actually have to say that in a lot of ways, they were saying similar things. I know you don't—may find that hard to believe, but from a scientific standpoint, they were. Dr. Casson was saying that, as a scientist, you can't say X. Dr. Omalu was also saying that as a scientist, I can't tell you that head trauma is the only factor. They said similar things, but they were emphasizing the exact opposite ends of the spectrum.

I saw some common ground there, believe it or not. I think that it's reasonable to make a judgment that repetitive head injuries to the degree that athletes experience can lead to dementing illness, I think that's a reasonable medical opinion to make. I agree with

Dr. Omalu that medical science is not an absolute science like physics, and so there's got to be some kind of guesswork there.

But I think it's also important to note that the medical argument and the policy argument, you can make policies and you can make decisions that make sense as a physician without having the science all lined up yet, and I think that's kind of the difference that those two guys are explaining.

Mr. PARRISH. There was no doubt in Dr. No's answers when Representative Sánchez showed the video at the last hearing. He answered three times "no" when he was asked if there was any connection. He didn't equivocate, he didn't say that it wasn't good science or any of that. All he said was "no." Three times, right?

Mr. COHEN. Yes, sir.

Mr. PARRISH. You guys remember it? I mean I'm not the only—I mean I didn't even make it to the last one for some unforeseen reasons, and I want to apologize for not being there, but it really wasn't my fault.

Mr. COHEN. Thank you, sir. And a digression before I go to Mr. Turley, I think Chairman Conyers might want him to close, did—and in skimming your book, I saw Tommy Bronson, I grew up in Memphis, and there was a Tommy Bronson Sporting Goods, is that the same——

Mr. PARRISH. No, Tommy Bronson, we grew up together in Gainesville, Florida, and then he went to the University of Tennessee and made All American 2 years in a row.

Mr. COHEN. He didn't get in the sporting goods business.

Mr. PARRISH. No, he's not in the sporting——

Mr. COHEN. Just a coincidence.

Mr. PARRISH. No, he owned—they owned mining companies all around.

Mr. COHEN. And Mr. Turley.

Mr. TURLEY. I'm not a doctor, but since we have a distinguished panel, Mr.—or Dr. Casson made a few statements that I would like to bring to light in relating boxing compared to football, and since we have Mr. Campbell here, my question to Mr. Campbell is in your experience as a trainer to boxing professionals, how often in the practice and training sessions are boxers submitted to full contact before entering the fight?

Mr. CAMPBELL. Sparring sessions or training sessions.

Mr. TURLEY. Training sessions, sparring sessions, how frequently in preparing for a competition is a boxer submitted to full contact blows.

Mr. CAMPBELL. Well, they do have it, and sometimes they have the head gear on, and sometimes it's without the head gear. That depends on their trainer.

Mr. TURLEY. So they do wear head gear.

Mr. CAMPBELL. Sometimes.

Mr. TURLEY. Right, and in a boxing competition, how many fights that you experienced would you say blows to the head consisted of per fight on the relative scale.

Mr. CAMPBELL. Sometimes two to—two to——

Mr. TURLEY. On an average fight, how many blows to the head would a fighter take.

Mr. CAMPBELL. Say upwards of 125, 140.

Mr. TURLEY. 125, 140. In my 9-year career, I played in over a hundred football games. During those years, I never missed one practice, maybe—well, maybe one or two. As a football—as a linemen on the football team, we are expected to go a hundred percent in every play and—as many of the linemen here can attest to that. That being said, over that career span, I suffered probably over 130,000 blows to the head, and that includes probably training camp where we're expected to go full speed every play.

Might not be the same for other positions, but as a lineman, as Mike Webster, as Justin Strelzyk, others who have, unfortunately, had to experience what I've gone through, Andre Waters, Chris Benoit, who's chalked up to having his incident be blamed on his steroid use when his signature move was a folding aluminum chair to the head off the ropes.

I find it offensive that Dr. Casson would make such statements and a complete contradiction and a lack of credibility to his medical career that he would make such statements without understanding the knowledge of head trauma that actually goes on in professional football, being that he was the chairman of that committee. He made a lot of statements that I find offensive and would like to place that in the record, and thank you Mr. Campbell, for your statements on that. I kind of find that it's very comparable to a boxing career, to a football career, and yet, I find it hard to believe that a doctor of his so-called qualifications would not understand that.

Mr. CAMPBELL. I agree with you and concur. He was very evasive on the undefinable, and he didn't vacillate, he just didn't want to answer.

Mr. COHEN. Mr. Chairman, I yield back my time to the Chair. Thank you, sir.

Mr. CONYERS. Do you have a concluding comment, Mr. Parrish.

Mr. PARRISH. I do, and I will conclude, but John Updike once said in a quote "It is difficult to make someone understand when his salary depends on him not understanding." That suits Roger Goodell, as well as Mr. Casson, but if you—what my conclusion is is that Congress—Chris Nowinski his left, I had agreed to donate my brain, but I'm here to tell you I'm taking it back if he takes the money from the league. I want my brain back.

If the league is putting a million dollars into a project, they're going to control it, believe me. I've only been at this for a while, so you know, no, I'm not participating if that's the way it's going to go. And the Government should fund this through the NIH, and the Government show oversee it. OSHA should be out watching the practices and watching the games and what the hell's going on, and it's, basically, you know, we feel as though this is—this is a—we don't want—going to court was a long, hard battle, and you guys can change things a whole lot quicker than we can.

I mean there are things that can be done, give the retired players a vote in the union. I mean that would change a lot of things in a hurry. So we're looking to guys, you folks for help, and actually, you're giving it to us. And I've been waiting since Senator Sam in 1965, but you folks, and including the ladies, Linda Sánchez, Maxine Waters, and Sheila Jackson Lee, and any other Members of the Committee. In fact, you have one owner, NFL

owner on your committee, don't you, Tom Rudy? Is it Tim Rudy? Rooney? From Florida, a representative?

Mr. CONYERS. Yes.

Mr. PARRISH. He's an owner. Be careful of him. But I thank you for having this, and we can't do it without you, that's all. We're asking for your help, and you know, we got to have it, and it—all the things that Mr. Turley and all the other fellows have said, I agree wholeheartedly with, and you can do us more good than anybody else, and we don't have to—I mean all—every time I turn around, Monty Clark here died, one of my old teammates, and believe me, I'm 73, okay, and I'm—and most of my guys are looking at the calendar now to tell time, and we need—we need some help now.

Mr. CONYERS. Of course your brother is a great help and assistance to you, he looks like he's in pretty good condition.

Mr. PARRISH. Well, he's doing all right. He loves this Detroit weather and all the folks here, he's been here forever, I'm trying to get him to come back to Florida, and he won't do it. He just loves it here.

Mr. CONYERS. I thank you so much. Mr. Schmidt, you have the last word this evening before we close down.

Mr. SCHMIDT. Thank you, Mr. Chairman. You know, I'm a great believer that there—there's—the glass is half full, and I have a lot of respect for Bernie and Bernie's advocacy over time, but I don't want to live on the history. I happen to believe that we can go forward here, but you have to stay and play, you and other Members of the Committee and other Members of the Senate as a referee. We don't need you to be on our side. That's not the name of this game. But we need you to be the referee to ensure the game is played fair, and right now, the balance of equities is way, way disproportionate.

All the leverage is in the hands of the owners, and I can speak from my relationship with Willie, I can speak for my son's—my youngest son played in the NFL 3 years ago. He injured himself after he played for the Jets and the Lions in NFL Europe. They brought him to Alabama to the famous Dr. Andrews, and they said we can't certify you to play anymore. This is a young man, 24 years old. They said we're going to settle with you for $2500.

Now, if you think this is an old person's issue, this affects everybody. So these folks, you know, have way, way too much leverage, and you've got to continue to be the referee. That's where the equity's going to be balanced.

Mr. PARRISH. Let me make one more important statement here. There is a Supreme Court case going right now, American Needle, all right? That is a—that will give—if the Supreme Court rules in favor of the NFL over American Needle, that will be the most devastating blow that we have—that we retired players, also, all players, and the public will have suffered at the hands of the NFL owners.

Now, Eric Holder is—was the—was working for Covington & Burling, and he represented the NFL against American Needle, and we—he needs to recuse himself from having anything to do with that case, and we need—we need for them—and I know that, you know, you—you can't influence the—the Supreme Court but

the—the—oh, the Solicitor General has—has asked the Supreme Court to send it back to the Appeal Court who ruled against us, okay? We need you on our side. Yes, we do. Believe me, we do, but—and if it goes back and for further clarification and they still uphold the—the victory for the NFL owners, we—we're going—it's going to—this will be the most devastating blow that we have ever suffered at the hands of the NFL.

Mr. CONYERS. I'm going to thank my staff, which has worked with me. This has been several—well, it's been a couple of months that it took to put all of the pieces together for this hearing, and they have been with me and worked many hours and on occasions when I didn't even know that they were working. I'd like to thank them from the bottom of my heart. [Applause.]

And, also, all of you because those of you here have made a record that has never been compiled before. As you know, these transcripts become public. They're published in the course of our work. This is an official hearing.

We invited every Member of the House Judiciary Committee that wanted to to come to be in attendance in this hearing, and so this is a huge step forward. As a matter of fact, we've received so much new information, so much past history, so many court decisions, so much other extraordinary government agency activity and executive branch activity that we're going to take a while before we make our next step so as to very carefully go over this. Fortunately, I have an incredible staff, both here in Detroit and in Washington, of a combination of lawyers, investigators, and scholars that can help us parse through the tremendous record that has been compiled here at Wayne University Medical School. I'm grateful to you all, and with that, the hearing is declared to be ended.

[Whereupon, at 6:56 p.m., the Committee was adjourned.]

APPENDIX

MATERIAL SUBMITTED FOR THE HEARING RECORD

PREPARED STATEMENT OF THE HONORABLE JAMES MORAN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF VIRGINIA

Opening Statement
Honorable James Moran

Mr. Chairman - We're dealing today with a billionaires' club benefitting from antitrust exemption. They make their money by paying a group of gladiators to beat up on each other for the pleasure of the fans and the profit of the clubs, and then too many of these gladiators die - tragically.

I say that because as you know, Mr. Chairman, the real tragedy of life is what dies inside of us while we live. We die when our brain dies. And, that is why this hearing is so important, Mr. Chairman.

MATERIAL SUBMITTED BY THE HONORABLE STEVE KING, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF IOWA, AND MEMBER, COMMITTEE ON THE JUDICIARY

THE WALL STREET JOURNAL.
WSJ.com

OPINION | OCTOBER 16, 2009, 10:27 P.M. ET

The Race Card, Football and Me

My critics would have you believe no conservative meets NFL 'standards.'

By RUSH LIMBAUGH

David Checketts, an investor and owner of sports teams, approached me in late May about investing in the St. Louis Rams football franchise. As a football fan, I was intrigued. I invited him to my home where we discussed it further. Even after informing him that some people might try to make an issue of my participation, Mr. Checketts said he didn't much care. I accepted his offer.

It didn't take long before my name was selectively leaked to the media as part of the Checketts investment group. Shortly thereafter, the media elicited comments from the likes of Al Sharpton. In 1998 Mr. Sharpton was found guilty of defamation and ordered to pay $65,000 for falsely accusing a New York prosecutor of rape in the 1987 Tawana Brawley case. He also played a leading role in the 1991 Crown Heights riot (he called neighborhood Jews "diamond merchants") and 1995 Freddie's Fashion Mart riot.

Not to be outdone, Jesse Jackson, whose history includes anti-Semitic speech (in 1984 he referred to Jews as "Hymies" and to New York City as "Hymietown" in a Washington Post interview) chimed in. He found me unfit to be associated with the NFL. I was too divisive and worse. I was accused of once supporting slavery and having praised Martin Luther King Jr.'s murderer, James Earl Ray.

Next came writers in the sports world, like the Washington Post's Michael Wilbon. He wrote this gem earlier this week: "I'm not going to try and give specific examples of things Limbaugh has said over the years because I screwed up already doing that, repeating a quote attributed to Limbaugh (about slavery) which he has told me he simply did not say and does not reflect his feelings. I take him at his word. . . ."

Mr. Wilbon wasn't alone. Numerous sportswriters, CNN, MSNBC, among others, falsely attributed to me statements I had never made. Their sources, as best I can tell, were Wikipedia and each other. But the Wikipedia post was based on a fabrication printed in a book that also lacked any citation to an actual source.

I never said I supported slavery and I never praised James Earl Ray. How sick would that be? Just as sick as those who would use such outrageous slanders against me or anyone else who never even thought such things. Mr. Wilbon refuses to take responsibility for his poison pen, writing instead that he will take my word that I did not make these statements; others, like Rick Sanchez of CNN, essentially used the same sleight-of-hand.

The sports media elicited comments from a handful of players, none of whom I can recall ever meeting. Among other things, at least one said he would never play for a team I was involved in given my racial views. My racial views? You mean, my belief in a colorblind society where every individual is treated as a precious human being without regard to his race? Where football players should earn as much as they can and keep as much as they can, regardless of race? Those controversial racial views?

The NFL players union boss, DeMaurice Smith, jumped in. A Washington criminal defense lawyer, Democratic

Party supporter and Barack Obama donor, he sent a much publicized email to NFL Commissioner Roger Goodell saying that it was important for the league to reject discrimination and hatred.

When Mr. Goodell was asked about me, he suggested that my 2003 comment criticizing the media's coverage of Donovan McNabb—in which I said the media was cheerleading Mr. McNabb because they wanted a successful black quarterback—fell short of the NFL's "high standard." High standard? Half a decade later, the media would behave the same way about the presidential candidacy of Mr. Obama.

Having brought me into his group, Mr. Checketts now wanted a way out. He asked me to resign. I told him no way. I had done nothing wrong. I had not uttered the words these people were putting in my mouth. And I would not bow to their libels and pressure. He would have to drop me from the group. A few days later, he did.

As I explained on my radio show, this spectacle is bigger than I am on several levels. There is a contempt in the news business, including the sportswriter community, for conservatives that reflects the blind hatred espoused by Messrs. Sharpton and Jackson. "Racism" is too often their sledgehammer. And it is being used to try to keep citizens who don't share the left's agenda from participating in the full array of opportunities this nation otherwise affords each of us. It was on display many years ago in an effort to smear Clarence Thomas with racist stereotypes and keep him off the Supreme Court. More recently, it was employed against patriotic citizens who attended town-hall meetings and tea-party protests.

These intimidation tactics are working and spreading, and they are a cancer on our society.

Mr. Limbaugh is a nationally syndicated talk radio host.

THE WALL STREET JOURNAL
WSJ.com

REVIEW & OUTLOOK | OCTOBER 16, 2009

Leveling Limbaugh

The NFL punts to left-wing political intimidation.

The National Football League, in which each Sunday men weighing 365 pounds slam headlong into men weighing 245 pounds, has decided it can't handle Rush Limbaugh, talk-show host, age 58. C'mon guys, show some guts.

What began as a normal business deal—Mr. Limbaugh's participation in a group bidding to buy the St. Louis Rams NFL franchise—has degenerated into an unfortunate flap whose repercussions could extend well past Sunday afternoon football.

We suspect Mr. Limbaugh during his broadcast yesterday put his finger exactly on what is going on here. He said that NFL Players Association head DeMaurice Smith was using Mr. Limbaugh's controversial status as leverage against the league owners in the union's difficult negotiations over a collective-bargaining agreement.

Earlier this year, the NFLPA's Mr. Smith and several player reps visited our offices and made clear their determination to win the negotiation with the league's owners. Fair enough. The group made a strong and businesslike case for their position. Mr. Smith was wrong, though, to send an email to the league's players earlier in the week, urging them to speak out on the Limbaugh bid, arguing that football "rejects discrimination and hatred."

After this, opposition to Mr. Limbaugh emerged from Indianapolis Colts owner Jim Irsay and, most disappointing of all, NFL Commissioner Roger Goodell. Mr. Goodell implied in a statement that Mr. Limbaugh's off-the-cuff comment in 2003 about quarterback Donovan McNabb (that the media wanted a black quarterback to do well) violated the league's "high standard."

We suspect Mr. Limbaugh would be happy to withdraw the 2003 remark, but to elevate it to racism, hatred and disqualification from doing business with the saintly NFL beggars belief. On the evidence, the NFL is the most forgiving league in sports. New England Patriots coach Bill Belichick, just for starters, must be thankful Mr. Goodell's "high standard" doesn't mean a lifetime ban from the NFL.

What happened here, and is happening elsewhere in American life, is that Mr. Limbaugh's outspoken political conservatism is being deemed sufficient reason to ostracize him from polite society. By contrast, MSNBC's Keith Olbermann, who fires off his own brand of high-velocity, left-wing political commentary but lacks Mr. Limbaugh's sense of humor, appears weekly as co-host of NBC's "Football Night in America." We haven't heard anyone on the right say Mr. Olbermann's nightly ad-hominem rants should disqualify him from hanging around the NFL. Al Franken made it all the way to the U.S. Senate on a river of political vitriol.

But Rush Limbaugh gets hung out to dry by someone of Roger Goodell's establishment prominence, and barely a soul from that same fastidious establishment has the courage to step forward to criticize it.

It is no secret that this country's politics has become intense across the ideological spectrum. Rush Limbaugh

lets his listeners blow off steam and then get on with the rest of their day. But if the people who claim to worry about such things want to see a truly angry right develop in this country, they should continue to remain silent while the left tries to drive Rush Limbaugh and others out of American political life. If that happens, the NFL by comparison will look like an afternoon tea.

RESPONSE TO QUESTIONS SUBMITTED TO ROGER GOODELL, COMMISSIONER, NATIONAL FOOTBALL LEAGUE, BY THE HONORABLE LINDA T. SÁNCHEZ, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF CALIFORNIA, AND MEMBER, COMMITTEE ON THE JUDICIARY

NATIONAL FOOTBALL LEAGUE

ROGER GOODELL
Commissioner

December 30, 2009

The Honorable Linda T. Sanchez
1222 Longworth House Office Building
Washington, DC 20001

Dear Congresswoman Sanchez,

I received your November 20 letter subsequent to my appearance before the House Judiciary Committee the previous month.

Your two questions and my responses are below:

1. **Is Dr. Ira Casson participating in any way with patient examinations for the medical study commissioned by the NFL?**

On November 25, 2009, the NFL announced a number of new developments regarding the NFL's ongoing work related to player health and safety in the area of concussions. I have attached a copy of this announcement for your review.

As you will see, Dr. Casson resigned from his position as co-chairman of the Mild Traumatic Brain Injury Committee. He is no longer participating in the study you reference in your question. That study has been suspended until a new Committee Chairman is named within the next 30-45 days.

2. **Some of the people participating in the study have other conflicts of interests. Two of the members on the concussion committee, Mark Lovell and Joe Maroon, own the company that makes and markets ImPACT (Immediate Post-Concussion Assessment and Cognitive Testing) – mainly through its use by most of the NFL teams – the neuropsychological test that is used in the study. Is that true?**

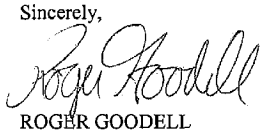
Drs. Lovell and Maroon created ImPACT in the early 1990s at the specific request of then coach Chuck Noll and team owner Dan Rooney of the Pittsburgh Steelers. They requested an objective test to determine when an athlete could safely return to play following a concussion. There are now over 700,000 athletes in ImPACT's database. After my office mandated in 2007 that neuropsychological testing be performed on all players, I am told many—if not all—clubs at their own option selected ImPACT because

it was the most scientifically validated test and the most user friendly. I understand it is now the standard of care for concussion management in the NFL, NHL, Major League Baseball, NASCAR and is used in thousands of colleges and high schools in the United States. It also was used in the suspended study I referred to above. It was a minor part of that study in that more detailed neuropsychological testing was administered and analyzed by an outside independent board-certified neuropsychologist.

Drs. Lovell and Maroon are well-respected for their contributions to the study of sports-related concussions. The accepted use of ImPACT by neurologists, neurosurgeons and neuropsychologists throughout the scientific community speaks for itself. The contributions of these two men to our Mild Traumatic Brain Injury Committee have been invaluable.

Thank you for contacting me. Please let me know if my office can be of further assistance.

Sincerely,



ROGER GOODELL

Attachment

ROGER GOODELL
Commissioner

NATIONAL FOOTBALL LEAGUE
280 Park Avenue, New York, NY 10017
*(212) 450-2000 * FAX (212) 681-7573*
WWW.NFLMedia.com

Joe Browne, Executive Vice President-Communications
Greg Aiello, Senior Vice President-Public Relations

FOR IMMEDIATE RELEASE
11/24/09

LATEST DEVELOPMENTS RELATING TO CONCUSSION PREVENTION AND TREATMENT

COMMISSIONER ROGER GOODELL today notified clubs of several new developments to the NFL's ongoing work related to player health and safety in the area of concussions.

"We have undertaken a series of initiatives that will enhance the substantial progress we have made in recent years in concussion-related matters," said Commissioner Goodell in a memo to NFL clubs. "Our goal remains to make our game as safe as possible, protect the health and safety of our players, and set the best possible example for players at all levels and in all sports."

The memo listed steps the NFL has taken as well as some of the others that are under consideration on this issue:

First, the NFL is strengthening and expanding the membership of its medical committee that has studied the subject of concussions and overseen concussion-related research for the past 15 years. The current co-chairmen, Drs. Ira Casson and David Viano, have resigned from those positions and will to continue to assist tha committee. The NFL is currently identifying their replacements and additional members who will bring to the committee independent sources of expertise and experience in the field of head injuries.

"I appreciate the valuable contributions of Drs. Casson and Viano and their commitment to the committee and to NFL players," said Commissioner Goodell.

Second, each club is identifying local neurosurgeons or neurologists who will be available to provide an independent "second opinion" in cases involving players who have had a concussion and been removed from a game or practice. Before these players return to practice or play, they must be evaluated and cleared by both their team doctor and the independent neurologist or neurosurgeon. The NFL and the NFL Players Association medical advisor are reviewing the expertise and qualifications of, and approve, each doctor proposed for this role.

Third, members of the NFL Competition Committee are continuing to evaluate potential changes in playing rules that are intended to reduce head impacts and related injuries in a game setting. Commissioner Goodell met yesterday with Committee co-chair Rich McKay and reviewed specific types of plays for that purpose.

Fourth, John Madden, in his role as special advisor to the Commissioner, is chairing a committee of coaches that is exploring ways of providing players with a safer environment that would reduce the risk of head trauma on non-game days. Among the considerations are reducing the overall amount of off-season work, and/or limiting the use of helmets (and therefore contact) in practice, minicamps, OTAs, and training camps. Madden's group will report its recommendations to the Competition Committee and Commissioner Goodell.

Fifth, in conjunction with the Centers for Disease Control (CDC), the league has developed an NFL public service message directed primarily at young athletes and their parents and coaches on the importance of head injury awareness. It will debut on the air on December 10. In addition, the league also is working with the CDC and other organizations to distribute educational material to young athletes and high school coaches, and to develop an overall certification program for coaches at those levels addressing player health and safety.

Sixth, as part of its continuing educational effort, the NFL will hold another medical conference in Washington, D.C., in June 2010 on concussions for team medical staffs and representatives of the NFLPA, similar to the conference that took place in Chicago in 2007. The NFL will again invite leading doctors and scientists to present the most current information regarding this injury. Club medical personnel will be required to attend.

Seventh, the NFL will continue to invest in research designed to improve equipment safety and will urge players to make informed choices regarding the use of the most technologically advanced helmets.

Commissioner Goodell told the clubs that these developments are the latest in a series of steps in recent years that have improved player safety, especially relating to concussions and other head injuries. He said he expects to advise them in the near future of additional steps that he has identified. These steps include new medical guidelines and research directed at the issue of long-term effects of concussions.

"Our game today is played with the understanding that medical decisions must always take priority over competitive interests," added Commissioner Goodell. "As a result, our sport is safer than it was previously. But we always strive to do better and the steps announced today will enhance the substantial progress we have made in recent years."

# # #

FOLLOW-UP MATERIAL SUBMITTED BY ROGER GOODELL, COMMISSIONER, NATIONAL FOOTBALL LEAGUE

NATIONAL FOOTBALL LEAGUE

ROGER GOODELL
Commissioner

October 30, 2009

The Honorable John Conyers, Jr.
Chairman, House Judiciary Committee
2426 Rayburn House Office Building
Washington, DC 20515

Dear Chairman Conyers:

As a follow-up to last Wednesday's hearing, enclosed is a memo that I received regarding Dr. Ira Casson.

Thank you for the opportunity to testify earlier this week.

Sincerely,

ROGER GOODELL

Enclosure

280 Park Avenue, New York, New York 10017 Tel (212) 450-2000 Fax (212) 681-7574

MEMORANDUM

TO: **Commissioner Goodell**

FROM: **Joe Browne**

DATE: **October 30, 2009**

SUBJECT: **Dr. Casson and the Judiciary Hearing**

You were questioned at the hearing two days ago by Congressman Weiner and then later by Chairman Conyers over whether our office was asked by the Committee to have Dr. Casson appear as a witness.

Background: The Committee staff requested from my department recommendations for witnesses. We offered them three members of our MTBI Committee-- Drs. Maroon, Morgenlander and Tucker.

We recommended those three doctors because we have seen them discuss the subject in other public forums and they have handled themselves very well. They also provided an opportunity to show that we listen to a diversity of medical perspectives, not just Dr. Casson, who is perceived by some as our only medical advisor on concussions. The staff later told us that they had attempted to reach Dr. Casson but they did not request that we produce him as a witness.

The story in the New York Times the day before the hearing included a quote by the Committee spokesman: "We asked the league to suggest witnesses who would be best able to address this matter and those three were not among those they recommended" (The three doctors the spokesman was referring to were Drs. Casson, Viano and Pellman.)

I agree with the Committee spokesman; they asked for recommendations but did not focus on any one individual.

We have worked closely with this Committee's staff over the years and will continue to do so subsequent to this hearing.

POST-HEARING QUESTIONS SUBMITTED TO ROGER GOODELL, COMMISSIONER, NATIONAL FOOTBALL LEAGUE

Questions for Commissioner Roger Goodell
National Football League
From Congressman Steve King (IA-05)

1. On October 13, 2009, in reference to potential NFL owner and talk show host Rush Limbaugh, you stated, "The comments that Rush made specifically about Donovan, I disagree with very strongly. They are polarizing comments that we don't think reflect accurately on the NFL or our players...I think divisive comments are not what the NFL is all about. I would not want to see those kind of comments from people who are in a responsible position within the NFL. No. Absolutely not." Prior to your statement, various media outlets, like MSNBC and CNN, were falsely reporting quotes by Rush Limbaugh—quotes that were complete fabrications. Did you take any of these fabricated quotes into consideration before mischaracterizing Mr. Limbaugh's statements?

2. During the hearing, you stated that you hold NFL team owners and other individuals related to the NFL to a high standard. Based on your standards I suggest you reevaluate all NFL minority owners, specifically Jennifer Lopez and Black Eyed Peas lead singer, Fergie. These two artists sing about glorifying drug use, violence against women, promiscuous sex and other inappropriate and illegal behaviors. Fergie and Jennifer Lopez have produced song lyrics that are extremely offensive to millions of Americans. Obscene lyrics like those in Jennifer Lopez's "I'm Real" or Fergie's "Where is the Love?" should not be heard in the public sphere, especially by children. Could you please explain to me how this kind of foul language is less divisive than past opinion commentary offered by Rush Limbaugh?

3. After considering the divisive language included in lyrics by Fergie and Jennifer Lopez, are you willing to reevaluate their minority ownership? Will you issue an apology to Rush Limbaugh for mischaracterizing his statements and obstructing his minority ownership of the St. Louis Rams?

LETTER FROM ROGER GOODELL, COMMISSIONER, NATIONAL FOOTBALL LEAGUE, TO THE HONORABLE STEVE KING, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF IOWA, AND MEMBER, COMMITTEE ON THE JUDICIARY

ROGER GOODELL
Commissioner

December 3, 2009

The Honorable Steve King
1131 Longworth Office Building
Washington, DC 20515

Dear Congressman King:

I received your November 16 letter regarding Rush Limbaugh and a possible sale of the St. Louis Rams franchise.

There are several groups that are interested in exploring a purchase of the Rams. I am told these groups include many possible investors. However, the current ownership is not fully committed to the sale.

I understand that Rush Limbaugh was one of those possible investors earlier this fall. I was asked at an October 13 press conference to update the media on the possible sale as well as to discuss Mr. Limbaugh's publicized interest and his 2003 comments regarding Donovan McNabb which led to his resignation shortly afterward at ESPN.

Among other things, I said I disagreed with his comments very strongly. I added that I would not want to see those kinds of comments from people who are in a responsible position within the NFL. I said that we in the NFL are held to higher standards.

I stand by my statements. A complete transcript of my comments on the subject from October 13 is attached.

I do not have a vote when a decision is made on ownership candidates. That decision is rightfully made by the owners of the 32 clubs.

I thank you for your interest and hope you enjoyed a pleasant Thanksgiving weekend.

Sincerely,

ROGER GOODELL

Attachment

Excerpts from Commissioner Goodell's Press Conference
Boston League Meeting
October 13, 2009

On Rush Limbaugh and criticism from African American community:
We had a report from the Rams this morning on their sales process. They are at an very extremely early stage on that. They have not even fully committed to selling the franchise. They gave us a brief update on the process without identifying any of the bidders, but mentioning very clearly there are multiple bidders. It's really premature for us to speculate on anyone that may or may not be involved in any of the ownership groups at this point in time because they have not all been fully identified to us. At this point in time, we'll continue our process which is to continue to allow the Rams to go through the process deciding whether they're going to sell and who they will sell to. At some point the NFL will be engaged and we will certainly put whatever ownership group is put forth through our process.

On some players saying they don't want to play for Rush. What is your response?
I've talked to players so I understand the issue of the players. The comments that Rush made specifically about Donovan [McNabb] I disagree with very strongly. They are polarizing comments that we don't think reflect accurately on the NFL or our players. I obviously do not believe that those comments are positive and they are divisive. That's a negative thing for us. I disagree with those comments very strongly and I have told the players that.

You mentioned disagreeing with Rush's comments about Donovan. It's one thing if a broadcaster does it, but do you take issue with an owner frequently making comments about issues political and racial?
I have said many times before that we are all held to a higher standard here. I think divisive comments are not what the NFL is all about. I would not want to see those kind of comments from people who are in a responsible position within the NFL. No. Absolutely not.

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