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IMPROVING SPORTS SAFETY: A MULTIFACETED APPROACH

HEARING

BEFORE THE

SUBCOMMITTEE ON COMMERCE, MANUFACTURING, AND TRADE

OF THE

COMMITTEE ON ENERGY AND COMMERCE

HOUSE OF REPRESENTATIVES

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[1] The report "Sports-Related Concussions in Youth: Improving the Science, Changing the Culture" and the accompanying slide presentation have been retained in committee records and also are available at *http://docs.house.gov/Committee/Calendar/ByEvent.aspx?EventID=101897.*

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[2] Mr. Gioia did not answer submitted questions for the record by the time of printing.
[3] A supporting document has been retained in committee files and also is available at *http://docs.house.gov/meetings/IF/IF17/20140313/101897/HHRG-113-IF17-Wstate-ShentonM-20140313-SD001.pdf.*

IMPROVING SPORTS SAFETY: A MULTIFACETED APPROACH

THURSDAY, MARCH 13, 2014

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON COMMERCE, MANUFACTURING, AND TRADE,
COMMITTEE ON ENERGY AND COMMERCE,
Washington, DC.

The subcommittee met, pursuant to call, at 10:22 a.m., in room 2322 of the Rayburn House Office Building, Hon. Lee Terry (chairman of the subcommittee) presiding.

Members present: Representatives Terry, Lance, Harper, Guthrie, McKinley, Kinzinger, Bilirakis, Johnson, Long, Upton, Schakowsky, Sarbanes, Matheson, Barrow, Christensen, and Waxman (ex officio).

Staff present: Charlotte Baker, Press Secretary; Kirby Howard, Legislative Clerk; Nick Magallanes, Policy Coordinator, Commerce, Manufacturing, and Trade; Brian McCullough, Senior Professional Staff Member; Shannon Taylor, Counsel, Commerce, Manufacturing, and Trade; Tom Wilbur, Digital Media Advisor; Michelle Ash, Democratic Chief Counsel, Commerce, Manufacturing, and Trade; and Will Wallace, Democratic Policy Analyst.

Mr. TERRY. I want to thank everyone for being here, and we are now with the full committee ranking member, the gentleman from California joins us. We now have the ability to start our hearing. So I will introduce you after my statement and before you start your testimonies. So I will open with my opening statement. Morning, Jan.

OPENING STATEMENT OF HON. LEE TERRY, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEBRASKA

So good morning and welcome to this morning's hearing. Today, it is my hope to learn what steps are being taken to make sports participation safer for all athletes.

Every day, parents make choices about whether or not to let their son or let their daughter play soccer, or what kind of mouthpiece to buy their son for his first day of Pop Warner football. Unfortunately, it seems like every day we hear about how participation in certain sports can be dangerous. It is easy to understand how what parents see in the news inevitably affects youth participation in sports.

Case in point: Earlier this year, President Obama said publicly that if he had a son, he wouldn't let him play pro football. Then the First Lady wants us all to move. Seems to conflict. Messages.

So now, we want a better understanding of the innovations being made by sports leagues, equipment manufacturers, and the medical community to make all sports safer. One clear example is the NHL which has been working hand in hand with the NHLPA to make hockey safer. Dating back to 1997, the NHL recognized the dangers of head injuries and took the proactive step of forming a Joint Concussion Committee. Additionally, the NHL also established a Department of Player Safety at its headquarters, the first of its kind for any professional league. USA Hockey and USA Football, two organizations that help oversee youth sports in the United States, have followed the lead of their professional counterparts by employing a multipronged approach to making participation safer. USA Hockey now requires coaches to complete an Online education module specific to the age group they are coaching at, and that includes safety information, concussion education, and proper techniques. USA Football, which is endowed by the generosity of the NFL and the NFLPA, was the first national governing body for any sport to participate in the CDC's heads-up concussions in youth sports.

Initiatives and all engaged in providing youth with non-tackling alternatives to develop their skills. Additionally, USA Football's Heads Up Football program encompasses 6 elements meant to make youth's football safer, including coach education and concussion recognition.

Proactive actions like the ones I just mentioned are exactly what parents need in order to be assured that everything possible is being done to keep their child as safe as possible while they are on the field or ice.

Researchers have also been hard at work to improve the tools that coaches and doctors have at their disposal when treating an athlete. For example, Dr. Dennis Molfese, sorry, Doc, who runs the University of Nebraska's Brain, Biology and Behavior Center located inside the Huskers Football Stadium, has been developing an MRI machine that can be used on game day to assess a head injury. This would allow medical staff to determine if a player has suffered a concussion, how severe the injury is, and if that player is able to return.

Equipment manufacturers are also using technology to make innovation changes to helmets, mouth guards, footwear and other equipment, all in order to reduce injuries. I feel confident saying that given the recent rule changes and the rate which technology is advancing, playing a contact sport today is likely safer than it has been in the past, however, we must accept that there is no silver bullet, no helmet or pad is going to prevent 100 percent of the injuries 100 percent of the time. This is why we need to consider a multipronged approach aimed at keeping our kids safer, while still promotion youth participation in sports. This involves listening to how leaders like the NFL, NHL, youth leagues and top tier university researchers are partnering to make progress towards making sports safer. These are the types of innovations and paradigm shifts needed to give parents the assurance that all the possible steps are being taken to improve the safety of their child on the field.

And I would like to thank our panelists for joining us here today, and willing to answer our questions. And I would especially like to

thank Dennis Molfese and Dr. Tim Gay for making the trips to Washington, DC, from Lincoln, Nebraska.

[The prepared statement of Mr. Terry follows:]

PREPARED STATEMENT OF HON. LEE TERRY

Good Morning-and welcome to this morning's hearing.Today, it's my hope to learn what steps are being taken to make sports participation safer for all athletes.

Every day, parents make choices about whether or not to let their daughter play soccer or what kind of mouthpiece to buy their son for his first day of Pop Warner football. Unfortunately, it seems like every day, we hear about how participation in certain sports can be dangerous. It's easy to understand how what parents see in the news inevitably affects youth participation in sports. Case in point: Earlier this year, President Obama said publicly that if he had a son, he wouldn't let him play pro football.

We want to better understand the innovations being made by sports leagues, equipment manufacturers, and the medical community to make all sports safer.

One clear example is the NHL, which has been working hand-in-hand with the NHLPA to make hockey safer. Dating back to 1997, the NHL recognized the dangers of head injuries and took the pro-active step of forming a Joint Concussion Committee. Additionally, the NHL also established a Department of Player Safety at its headquarters, the first of its kind for any of the professional leagues.

USA Hockey and USA Football, two organizations that help oversee youth sports in the U.S., have followed the lead of their professional counterparts by employing a multi-pronged approach to making participation safer. USA Hockey now requires coaches to complete an online education module specific to the age group they are coaching that includes safety information, concussion education and proper techniques. USA Football, which is endowed by the generosity of the NFL and NFLPA, was the first national governing body for any sport to participate in the CDC's "Heads Up Concussion in Youth Sports" initiative and has also engaged in providing youth with non-tackling alternatives to develop their skills. Additionally, USA Football's Heads Up Football program encompasses six elements meant to make youth football safer, including coach education and concussion recognition.

Proactive actions like the ones I just mentioned are exactly what parents need in order to be assured that everything possible is being done to keep their child safe while they are on the field or the ice.

Researchers have also been hard at work to improve the tools that coaches and doctors have at their disposal when treating an athlete. For example, Dr. Dennis Molfese, who runs the University of Nebraska's Center for Brain, Biology and Behavior, located inside the Husker's football stadium, has been developing an MRI Machine that can be used on game day to assess a head injury. This would allow the medical staff to determine if a player has suffered a concussion, how severe the injury is, and if that player is able to return to the game. Equipment manufacturers are also using technology to make innovative changes to helmets, mouth guards, footwear and other equipment—all in order to reduce injuries.

I feel confident saying that given recent rule changes, and the rate which technology is advancing, playing a contact sport today is likely safer than it has been in the past. However, we must accept that there is no "silver bullet." No helmet or pad is going to prevent 100 percent of the injuries 100 percent of the time.

This is why we need to consider a multi-pronged approach aimed at keeping our kids safer while still promoting youth participation in sports. This involves listening to how leaders like the NFL, NHL, youth leagues and top-tier University researchers are partnering to make progress towards making sports safer. These are the types of innovations and paradigm shifts needed to give parents the assurance that all possible steps are being taken to improve the safety of their child on the field.

I would like to thank our panelists for joining us today and being willing to answer our questions. I would especially like to thank Dr. Dennis Molfese and Dr. Tim Gay for making the trip to DC from the University of Nebraska at Lincoln.

Mr. TERRY. And my time is over, so I will recognize the ranking member, Jan Schakowsky, from Illinois.

OPENING STATEMENT OF HON. JANICE D. SCHAKOWSKY, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF ILLINOIS

Ms. SCHAKOWSKY. Thank you, Mr. Chairman. This is a very important hearing on improving sports safety. I look forward to hearing from all of our witnesses on both panels about their perspectives, experiences, proposals about how to make sports safer for everyone, from children to professional athletes.

Athletes are continually becoming bigger and faster and stronger, and despite some efforts to make sports safer, much work remains. Three hundred thousand sports-related traumatic brain injuries occur annually in the United States. Sports are the second leading cause of traumatic brain injury among people age 15 to 24 years old, second only to motor vehicle accidents. This is a crisis and one this subcommittee should do everything in its power to address.

We are going to hear today from Ian Heaton, a high school senior, who suffered a severe head injury during a lacrosse game in his sophomore year. Despite his impressive recovery, that hit, later identified as his third head injury, left him with a limited ability to enjoy the types of activities many of his high school students, classmates, take for granted. His story should serve as a reminder that youth sports injuries can have have devastating and lasting consequences. And we will also hear on this panel from Briana Scurry, an Olympic and World Cup soccer champion, a goalie, forced from the field after a career-ending traumatic brain injury almost 4 years ago. Her struggle to overcome the cognitive, physical, and psychological injuries that followed illustrate that even our sports heroes are vulnerable to the worst sports injuries.

Both Ian and Briana should be commended for their courage, and I thank you, Briana, in their recoveries and for their willingness to testify on this critical issue.

Dave Duerson, a Pro Bowl and Super Bowl-winning safety, and former member of my hometown Chicago Bears, tragically committed suicide just over 3 years ago. In doing so, he shot himself in the chest to avoid any impact on his brain, which he asked to have donated to medical research in order to allow scientists to study the impact of the brain trauma he suffered over his 11-year professional career. It was later disclosed that Duerson suffered from a "moderately advanced" case of chronic traumatic encephalopathy, a disease linked to repeated blows to the head, which can result in memory loss, depression, and dementia.

The Heaton and Scurry stories prove that severe, career-ending sports injuries can occur at any level of competition, and the Duerson case should make it clear to all of us that the impacts of brain trauma go way beyond an athlete's days on the field and can become more severe over time.

We will also hear today from medical and scientific experts who have studied the impacts of brain injuries on athletes of all ages. We will hear about the importance of taking athletes off the field of play as soon as there is a suspicion of a brain injury, and keeping them off until they are cleared by a responsible and trained individual.

And finally, we will hear from the NHL, the NFL, and youth hockey and football leagues that are responsible for mitigating traumatic brain injury in their sports. I hope to learn what changes they have implemented, and will implement, to rules, practice drills and other aspects of the games that will reduce the risk of brain injury moving forward.

I am not advocating for an end to sports as we know it, or maybe not exactly as we know it right now, but I also feel strongly that 300,000 head injuries per year are too many to overlook. We should take reasonable steps to reduce the risk. And I look forward to hearing from all of our witnesses. I hope this hearing will help the subcommittee to better understand the safety risks in sports, and what we can and should be done to limit these risks.

And I yield back the balance.

Mr. TERRY. Thank you very much. At this time, recognize the vice chairman of the committee, Mr. Lance, from New Jersey.

OPENING STATEMENT OF HON. LEONARD LANCE, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEW JERSEY

Mr. LANCE. Thank you very much, Mr. Chairman, and thank you for holding this extremely important hearing. I want to thank Dr. James Johnston, who will be one of the witnesses, who came to my office earlier this morning. Thank you, Dr. Johnston.

Experts generally agree that a concussion can be classified as a brain injury, ranging in seriousness from mild to dramatic. The Center for Disease Control states a concussion is caused by a bump, a blow or a jolt to the head, or blow to the body that causes the head to move quickly. According to the CDC, the sports that reported the highest number of traumatic brain injuries were bicycling, football, playground activities, basketball and soccer.

From 2010 through 2013, the participation rate of children in youth soccer and football dropped considerably, and some have pointed to the increased risk of TBI's as a result of participating in these sports as a reason for the drop in that participation.

The increased spotlight on concussions in sports has resulted in an increased amount of research in brain injuries, as well as research on how to improve sports equipment in order to prevent such injuries from occurring. Collegiate and professional sports leagues have implemented standards and revised their rules in order to decrease the number of brain injury incidents. The NHL has, as has been indicated, has required its players to wear helmets on the ice, and the NFL instituted new standards for evaluating concussions on the sidelines after the league reported an occurrence of 223 concussions in just over 300 games in the 2010 season.

And State and Federal Governments have also been involved in tightening safety standards, and since 2009, all 50 States and the District of Columbia have adopted laws protecting youth and high school athletes from returning to play too soon after suffering a concussion or a potential concussion.

This hearing will focus on what more can be done to prevent brain injuries from occurring in sports, and this is at the youth

level, the amateur level and at the professional level. And I look forward to the testimony of our distinguished panels.

Thank you, Mr. Chairman.

Mr. LANCE. I have two and a half minutes remaining. Is there any other member on the Republican side who would like to speak with an opening statement?

Mr. TERRY. OK.

Mr. LANCE. I yield back the balance of my time.

Mr. TERRY. Especially Missouri. Do they play sports? And on behalf of the Big 10, I want to welcome Rutgers to the Big 10. At this time——

Mr. LANCE. Thank you very much.

Mr. TERRY [continuing]. Five minutes to the full ranking member of the Energy and Commerce Committee, Mr. Waxman.

OPENING STATEMENT OF HON. HENRY A. WAXMAN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF CALIFORNIA

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

Decades ago, many thought that head injury was serious only if a player was completely knocked out unconscious, and/or suffered a severe contusion, after frequent painful blows, even a young athlete could continue to play, but we now have strong indications that the effects of repeated brain trauma in sports, even those received during one's youth, can accumulate with consequences that are long-term debilitating and even life-threatening. These consequences can stem from injuries once considered minor, known as subconcussive blows, which may not be accompanied by any immediate adverse symptoms.

Serious psychological and emotional disorders have been documented among former athletes that have suffered repetitive brain trauma. Researchers have, a number of times, found evidence of the neurodegenerative disease, CTE, when examining the brain tissue of dozens of deceased former NFL players. New imaging technologies have been able to show the metabolic changes in the brain associated with concussions and subconcussive blows.

Brain injuries in sports can occur in a wide variety of situations, and different athletes' brains may respond differently to an injury. Sports-related brain injury is a complex matter, requires addressing many interconnected issues, so when the title of this hearing suggests we take a multifaceted approach to improve sports safety, I could not agree more.

First, we need more neuroscience research, radiological and longitudinal research methods can lead to earlier, more accurate diagnoses, a better understanding of the risk factors, and maybe better treatment options for brain injuries.

Second, doctors, league associations, coaches, parents, players need to work together to establish health regulations, game rules and a sporting culture that reflects the seriousness of brain injury, and put the athlete's health first.

Third, we must address the health and safety risks associated with the athletic equipment, and pursue a better understanding of how this equipment might be improved.

Three years ago, Congressman Butterfield and I wrote to the then-chairman at the time of the subcommittee and full committee chairman, calling for hearings about inadequate testing standards, lax reconditioning certifications, economic disparities regarding the safety of football helmets used by millions of American athletes. We are going to touch on some of those issues today, but I believe those issues merit deeper consideration than they are likely to get at today's hearing, and the subcommittee chairman might consider holding separate hearings on these matters.

I think it is valuable that the National Football League is testifying here today, given recent and ongoing disputes between the league and its players on this very topic. However, I believe its players organizations should also testify. Unfortunately, the late notification of the NFL testifying made it difficult for us to secure players' witness.

Mr. Chairman, today's hearing is important. I appreciate the subcommittee review of sports-related brain injuries, and I look forward to working together, all of us, on this issue in the months ahead. Thank you for holding the hearing, and I look forward to the testimony of the witnesses.

Yield back my time.

Mr. TERRY. Still have a minute left, if the gentleman from Utah wanted to use it.

Mr. WAXMAN. Well, I might just point out that moving physically and conditioning the body is not anywhere near dangerous as subjecting oneself to brain injuries, so I don't think they are contradictory.

Mr. TERRY. Yes. It is interesting, but the issue is we want kids to go out and play. We want them to join youth leagues.

Mr. WAXMAN. And we want sports, but we want to make it as safe as possible.

Mr. TERRY. Absolutely. And to use your last 26 seconds, then, this is one of those where Jan and I both agreed was necessary. So this has been a bipartisan effort.

So with that, let us move on to our witness panel. And I am going to introduce the entire panel now, and then we will start with Mr. Daly. So we are blessed to have Mr. William Daly, III, Deputy Commissioner of the NHL. Next to him is David Ogrean, Executive Director of USA Hockey. Then we have Mr. Jeff Miller, Senior Vice President, Player Health and Safety Policy, National Football League. Thank you very much for being here. And then Scott Hallenbeck, Executive Director, USA Football. Then a face of a brain injury, concussions, multiple concussions, within soccer, Briana Scurry, a former professional goalkeeper, U.S. Women's National Soccer Team. In the next panel we will have Ian, who is the other face of high-school-level concussions.

So with that, Mr. Daly, you are now recognized for your 5 minutes.

STATEMENTS OF WILLIAM L. DALY, DEPUTY COMMISSIONER, NATIONAL HOCKEY LEAGUE; DAVE OGREAN, EXECUTIVE DIRECTOR, USA HOCKEY; JEFF MILLER, SENIOR VICE PRESIDENT, HEALTH AND SAFETY POLICY, NATIONAL FOOTBALL LEAGUE; SCOTT HALLENBECK EXECUTIVE DIRECTOR, USA FOOTBALL; AND BRIANA SCURRY, FORMER PROFESSIONAL GOALKEEPER, U.S. WOMEN'S NATIONAL SOCCER TEAM

STATEMENT OF WILLIAM L. DALY

Mr. DALY. Thank you. I would like to thank the chairman, the ranking member, and the subcommittee members for inviting me to testify today regarding the National Hockey League and the proactive steps it has taken to promote the health and safety of the best professional hockey players in the world.

As its playing surface is enclosed by boards and glass, making it the only major professional sport with no out of bounds, hockey is a physical game. At the NHL level——

Mr. TERRY. Is your mic on?

Mr. DALY. It was, yes.

Mr. TERRY. Just pull it a little lower and closer.

Mr. DALY. I will bring it closer. At the NHL level, our players want it to be physical, and our fans want it to be physical, but importantly, all constituent groups associated with the game also want it to be safe. This objective necessarily includes promoting safe and responsible play in our game, and the National Hockey League, working together with the National Hockey League Players' Association, has gone to elaborate lengths to do that and will continue to do so.

We are pleased to have this opportunity to share with this subcommittee some of the measures enacted in this pursuit. The National Hockey League was the first major professional sports league to launch a comprehensive league-wide program to evaluate players after they incur head injuries. Beginning in 1997, the NHL/NHLPA Concussion Program has required that all players on all clubs undergo preseason baseline neuropsychological testing. After a player is diagnosed with a concussion, he undergoes post-injury neuropsychological testing, and his pre- and post-injury test results are compared to determine when the player is safe to return, or returns to neurological baseline, which is a relevant determination in the player's ability to safely return to play.

Data collected and analyzed pursuant to the NHL/NHLPA Concussion Program confirmed to us early on that neuropsychological testing results had added value, and should be taken into account, along with player reported symptoms when making return-to-play decisions.

The NHL/NHLPA Concussion Committee also has taken affirmative and proactive steps to issue league-wide protocols regarding the diagnosis, management and treatment of concussion. Education regarding concussions and, importantly, the issuance of warnings to players relating to the risks of returning to play before the recovery from a prior concussion is complete, have been a core component of the NHL/NHLPA Concussion Program since its inception. Education is provided regularly to all relevant constituents in our

league, including our players, club personnel and NHL on-ice officials.

In addition to enforcing existing playing rules, such as charging, crosschecking and high-sticking, and more stringently penalizing dangerous contact, several new playing rules have been adopted specifically to prohibit involving a player's head. Our current rule specifically prohibits any body contact with an opponent's head when the contact is otherwise avoidable, and the head is the main point of contact. Changes this season to adopt the hybrid icing rule, and modifications of rules regarding fighting, have further enhanced player safety. With respect to the fighting issue in particular, while it remains a small part of the game, its role is diminishing. Through 75 percent of the 2013–2014 regular seasons, 68 percent of the games played have been completely free of fighting, the highest such percentage since 2005–2006. In addition, the number of major penalties assessed for fighting is down 15 percent from last season, and down 31 percent from the 2009–2010 season.

In this important area, it would be the league's intention to raise, discuss and negotiate any potential playing rule changes regarding fighting directly with the National Hockey League Players' Association. Ultimate enforcement of the playing rules through supplementary discipline is in the hands of the Department of Player Safety, the first league department of its kind in professional sports. This department monitors every one of our 1,230 regular season games, plus all of our playoff games, and assesses every hit, indeed, every play, to ensure the league's standards for safety and responsible play are being adhered to. When the Department determines that the standard has been violated, supplemental discipline is assessed in the form of a suspension or a fine, and the Department creates a video that explains to our players and our fans why the behavior merited punishment. The cumulative effect of these efforts has begun to change the culture of the game in a positive way. As we can see on a nightly basis, players avoiding dangerous plays and gratuitous contact that they, no doubt, would have engaged in just a few short years ago.

Since the adoption of the mandatory helmet rule in 1979, the NHL, together with the NHLPA, has continued to impose a series of additional regulations regarding player equipment relating to player safety generally, but also to head injuries more specifically, including most recently a rule adopted prior to the start of this season that mandated the use of face shields by all incoming players, the effect of which should reduce head injuries generally, in addition to providing enhanced protection for players' eyes.

The NHL also has participated in concussion initiatives that extend beyond the NHL, including its representatives' participation at each of the 4 International Concussion and Sport Conferences between 2001 and 2012, its support of Federal and State legislative initiatives regarding concussions, and the league's support and assistance in the development of concussion educational programs for youth and junior-age hockey players.

To summarize, while recognizing there is considerable work to be done, the National Hockey League has been, and will remain, absolutely committed to promoting the safety of its players. We firmly believe it is not only the right thing to do for our players, but it

is the right thing to do for our business, both in terms of promoting participation at the youth hockey level, and in maximizing interest by fans and consumers of the sport at the professional level.

Again, I thank the chairman, the ranking member, and the subcommittee members for your time and invitation to speak to you this morning.

[The prepared statement of Mr. Daly follows:]



STATEMENT OF WILLIAM L. DALY BEFORE THE HOUSE OF REPRESENTATIVES COMMITTEE ON ENERGY AND COMMERCE, SUBCOMMITTEE ON COMMERCE, REGARDING CONCUSSIONS IN SPORTS

SUBMITTED IN CONNECTION WITH
TESTIMONY ON MARCH 13, 2014

I would like to thank the Chairman, the Ranking Member and the Subcommittee Members for inviting me to testify today regarding the National Hockey League ("NHL" or "League") and the proactive steps it has taken, in collaboration with the National Hockey League Players' Association ("NHLPA"), to promote the health and safety of the best professional hockey Players in the world.

As its playing surface is enclosed by boards and glass, making it the only major professional team sport with no "out of bounds," hockey is a physical game. At the NHL level, our Players want it to be physical. And our fans -- who continue to attend our games in new record numbers almost every year (at least 20 million in attendance in every full season since the turn of the century) -- want it to be physical. But, importantly, all constituent groups associated with the game also want it to be safe, within the context of the physical, high speed game that it is and always will be.

Generations of youngsters have grown up loving hockey, and the National Hockey League's objective is to make sure that the best game in the world continues to improve as it is passed on to the generations that follow. This objective necessarily includes promoting safe and responsible play in our game, and the National Hockey League, working together with the NHLPA, has gone to elaborate lengths to do that and we will continue to do so. We are proud to note that enrollment in hockey playing programs sponsored by USA Hockey, the national governing body for our sport at the youth and adult level, is at a record high -- approaching 600,000. At the professional level, we want to do everything we can to encourage young people and adults alike to continue to participate in and consume the game in all forms and at all levels. The game of hockey brings families and communities together. It instills the most positive attributes of competitive excellence. It fosters teamwork, character and commitment to a common goal.

It is for these and other reasons that the National Hockey League considers the safety of our Players to be a top priority. And with respect to head injuries in particular, we and the NHLPA recognized early on -- as far back as 1997 -- the importance of the injury and the benefits that would be associated with designing and implementing new prevention and management initiatives. We are extremely pleased to have this opportunity to share with this Subcommittee some of the measures enacted in this pursuit, including:

1. Early Focus on Concussion Diagnosis and Treatment: One of the NHL's initial and most impactful initiatives was its formation of a joint Concussion Committee with the NHLPA in 1997 -- a full four (4) years before the First International Conference on Concussion in Sport convened in Vienna in 2001. This Committee set up a League-wide program pursuant to which Players are assessed in the pre-season "at baseline" and those neuropsychological test results are compared to post-injury test results as a means to help determine when it is safe for a Player to return-to-play following a concussion. The NHL/NHPA Concussion Committee also has taken affirmative and proactive steps over many years to issue League-wide

recommendations and protocols regarding the diagnosis, management and treatment of concussions (the "NHL/NHLPA Concussion Program").

2. Education: Education has been a vital component of the NHL/NHLPA Concussion Program since its inception. Educational efforts are directed towards all relevant parties in our game, including most importantly our Players, but also relevant Club personnel, including Club medical staff, Club owners and executives, team General Managers and Coaches, and on-ice game Officials.
3. Playing Environment: Over time, the League has adopted policies and regulations aimed at "softening" the arena playing environment. While, as noted at the outset, there is only so much we can do in this area without fundamentally changing the game, both the NHL and the NHLPA recognize the importance of the effort as evidenced by our agreement in the most recent round of collective bargaining to form a joint Playing Environment Subcommittee to examine and make recommendations on the issue.
4. Playing Rules/Supplemental Discipline: In addition to enforcing existing Playing Rules more stringently to penalize dangerous body and other contact, several new Playing Rules have been adopted specifically to prohibit contact involving a Player's head. Ultimate enforcement of these Playing Rules is in the hands of the Department of Player Safety, the first League Department of its kind in professional sports, which monitors every one of our 1,230 Regular-Season games plus each of our Playoff games and assesses every hit -- and every play -- to ensure the League's standards for safety and responsible play are adhered to.
5. Player Equipment Regulation: Since the adoption of a mandatory helmet Rule in 1979, the NHL, together with the NHLPA, has continued to impose a series of additional regulations regarding Player equipment relating both to Player safety generally, but also to "the head" or head injuries more specifically. The League continues to explore potential new regulations in this area in conjunction with the NHLPA.

NHL and NHLPA representatives also have participated in concussion initiatives that extend beyond "the NHL."

- Between 2001 and 2012, NHL and NHLPA representatives participated in, and indeed took a leadership role at, each of the four (4) International Concussion in Sport Conferences. These symposiums were conducted in 2001, 2004, 2008 and 2012. The NHL/NHLPA Concussion Program has incorporated findings and recommendations from each of the International Concussion in Sport Conferences, to ensure that the approach in our League is compatible with the latest science and research on brain injuries in sport. These steps include the NHL/NHLPA Concussion Committee's adoption of the scientific community's definition of concussion from the 2001 Conference, its introduction of an updated sideline evaluation tool for brain injuries from the 2008 Conference, and its adoption of the Conference's recommendation that Players diagnosed with a concussion should never be returned-to-play in the same day from the 2012 Conference.

- The League has supported federal and state legislative efforts aimed at the establishment of concussion safety guidelines; increased education about "concussion" both for student athletes and for those who interact with student athletes; and appropriate concussion management techniques and standards. The League also has actively supported legislation prohibiting deceptive or fraudulent claims with respect to the safety benefits of athletic sporting equipment sold in interstate commerce.

- In addition, the League has supported and assisted in the development of concussion educational programs for youth and junior age hockey Players. Indeed, pursuant to our most recent agreement with the Canadian Hockey League, each of Ontario Hockey League, Quebec Major Junior Hockey League and the Western Hockey League will develop comprehensive new concussion education programs for its Players which will focus on the diagnosis and treatment of concussions, and will highlight the importance of Players reporting symptoms and the dangers associated with head injuries generally. These junior hockey league programs will be financed by funds made available by the National Hockey League and its Member Clubs.

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A concussion is an extremely complicated injury. Just as concussion has been described as an "evolving" injury, advanced research into its complexity and short and long-term effects is generally considered to be an emerging science dating roughly back over the past two (2) decades. While there is not yet a clear understanding of many of the scientific and medical aspects of concussion, the NHL/NHLPA Concussion Program has certainly contributed to the scientific understanding of concussion in sports and we have been leaders in this regard.

The NHL was the first major professional sports league to launch a comprehensive, League-wide program to evaluate Players after they incur head injuries. Recognized in 2008 by the National Academy of Neuropsychology, the NHL/NHLPA Concussion Program is one that other professional and amateur sports leagues have tried to emulate. Beginning in 1997, the League's Program has required that all Players on all Clubs undergo pre-season "baseline" neuropsychological testing. After a Player is diagnosed with a concussion, he undergoes post-injury neuropsychological testing and his pre- and post-injury test results are compared to determine when the Player returns to "neurological baseline" -- a relevant determination in the Player's ability to safely return-to-play. Notably, at the time the NHL/NHLPA Concussion Program was first launched, neuropsychological testing had not yet been validated as a useful tool in making the decision whether a Player is ready to return-to-play. Indeed, it was the data collected and analyzed pursuant to the NHL/NHLPA Concussion Program that confirmed to us that neuropsychological testing results had "added value" and should be taken into account along with Player-reported symptoms when making return-to-play decisions.

A defining characteristic of the NHL/NHLPA Concussion Program is that it has functioned in a centralized manner since its inception. All NHL Clubs administer the same battery of tests to all Players in the same format and in the same time sequence. The test data

are collected and stored centrally, and if a Player is traded, his data follows him to his new Club. As a result, all NHL Players undergo the same individualized concussion management program irrespective of the Club for which they play. The Program provides for the administration and interpretation of the neuropsychological tests to be performed by independent Club neuropsychologists, based on the NHL/NHLPA Concussion Committee's view that neuropsychologists are the medical personnel best-suited to evaluate the neurocognitive aspects of concussion. (The experts in the 2004 International Concussion in Sport Conference similarly recognized this, citing neuropsychologists' "background and training.")

Another key aspect of the NHL/NHLPA Concussion Program is its unique approach in dealing with Player differences that are attributable to disparate ethnic, linguistic, and educational backgrounds. To this end, the Program has amassed the largest multi-lingual dataset of any professional sport, which allows Players to be compared to other Players with the same ethnic and linguistic backgrounds. In addition, advanced psychometric techniques have been employed to calculate culture-specific "Reliable Change Scores," which allow neuropsychologists to more accurately assess clinically significant changes in functioning from baseline to post-injury assessments.

In 2010, the NHL/NHLPA Concussion Committee codified our then-current policies and protocols into a single document entitled the NHL Concussion Evaluation and Management Protocol. This Protocol, which was consistent with international guidelines, provided for the mandatory removal of a Player from play whenever a concussion is suspected. Thereafter, the Player may be returned-to-play if he has no symptoms both at rest and after strenuous activity, and has returned to his cognitive baseline. This Protocol allowed for the initial concussion evaluation to occur on the bench or in the locker room, and emphasized that concussions are an evolving injury and that symptoms may evolve over time.

Since its initial distribution and implementation, the Protocol has been modified on several occasions to reflect current developments in the scientific community and the League's own experience with concussions. Notably, in March 2011, the Protocol was revised to include a precise articulation of specific signs and symptoms of concussion that, if observed or reported, require the removal of a Player from play for evaluation in a distraction-free environment, away from arena lights and noise, using a standardized assessment tool. The NHL/NHLPA Concussion Committee was a leader in identifying and articulating these observable signs (any loss of consciousness, motor incoordination/balance problems, blank or vacant look, disorientation, slow to get up following a hit to the head, clutching of the head after a hit, visible facial injury in combination with any of the other signs) and recognizing the value of incorporating them into a standardized Protocol so that a consistent approach could be followed for all Players on all Clubs. Notably, in 2012 the International Concussion in Sport group similarly incorporated "visible signs of concussion" into its sideline evaluation tool and other professional leagues also have since adopted this approach. Effective for the 2013/14 NHL season, the Protocol was modified to comport with recently-issued guidelines from the International Concussion in Sport conference of 2012, to prohibit same day return-to-play for Players who have been diagnosed with a concussion. Finally, our Protocol has been followed

and embraced by other minor professional hockey leagues, as well as professional leagues in other sports.

Education regarding concussions, and importantly, the issuance of warnings to Players regarding the risks of returning-to-play before the recovery from a prior concussion is complete, have been a core component of the NHL/NHLPA Concussion Program since its inception. Our recent educational initiatives have focused on articulating and identifying many of the common visible signs and symptoms of a concussion so that Players will recognize when they, or a teammate, may be at risk. Education is provided regularly to all relevant constituencies in our League, including Players, Club personnel and NHL on-ice Officials. It is our strong belief that the Players' health and safety will be enhanced if all relevant personnel clearly understand the latest science regarding concussions, as well as the requirements and necessary elements of the NHL/NHLPA Concussion Protocol.

The NHL and the NHLPA have had a proactive and collaborative approach to the adoption of concussion-related initiatives. The NHL/NHLPA Concussion Committee regularly discusses and explores whether modifications should be made to specific aspects of the Program, including elements of the Protocol and other recommendations to the Clubs with respect to the management of concussions, in order to promote the health and safety of the Players. In addition to taking steps to address the diagnosis and management of concussions once they occur, the NHL and the NHLPA also have been proactive in exploring potential new initiatives and game modifications to improve the safety of the game, and to reduce the incidence of concussions in the first instance. Recent initiatives that the League and the NHLPA have adopted through their joint efforts include:

Playing Rules:

- Hits to the Head: We have a clear policy that prohibits any body contact with an opponent's head when the contact is otherwise avoidable and the head is the main point of contact. An earlier and less expansive form of the current Rule was originally adopted in 2010 by the NHL and NHLPA, with a prohibition on "lateral" or "blindside" contact with an opponent's head where the head was targeted and/or the principle point of contact.

- Hits from Behind: In 2011, the League's pre-existing prohibition on checking a Player into the boards (i.e., "boarding") was modified and strengthened by the NHL (and NHLPA) to prohibit a Player from checking or pushing a defenseless opponent in a manner that causes the opponent to hit or impact the boards violently or dangerously. The revised Rule assigned responsibility to the Player delivering the check to ensure that his opponent is not in a vulnerable position.

- Charging, Cross Checking, High Sticking: It has been the League's long-standing approach and direction to on-ice officials to strictly enforce existing Playing Rules, such as charging, cross checking, and high sticking, particularly where potential head contact and injuries are involved.

- Hybrid Icing: Several years ago the NHL (and NHLPA) introduced a "zero tolerance" standard on contact delivered by a forechecking Player to a defending Player on "touch" icing plays. While the Rule modification had its intended effect of reducing the number of injuries resulting from races for the puck, the League (and NHLPA) nevertheless moved further to protect Players by instituting a so-called "hybrid icing" Rule in advance of the 2013/14 season. Pursuant to the new Rule, icing plays are whistled prior to Players reaching the endboards, thereby and for all intents and purposes eliminating the possibility of Player contact and collisions on icing plays.

- Supplemental Discipline: Enforcement of the Playing Rules through "supplementary discipline" (i.e., penalties over and above those issued during a game) is in the hands of the NHL Department of Player Safety -- a Department that is the first of its kind in professional sports. Now in its third season of operation, the Department is headed by Hall of Fame forward and former Player Brendan Shanahan and is staffed by a team of hockey experts, including Hall of Fame defenseman Brian Leetch, former NHL All-Star defenseman Stephane Quintal, and former Philadelphia Flyers scout Patrick Burke. The Department monitors every Regular Season and Playoff game and assesses every hit to make sure the League's standards for safety are being adhered to. When the Department determines that the standard has been violated, action is taken in the form of a fine or a suspension of varying length, depending on the severity of the incident, in accordance with the Collective Bargaining Agreement ("CBA") between the NHL and the NHLPA. When supplemental discipline is assessed, and occasionally when it is not assessed, the Department creates a video, distributed through our media assets (NHL.com, NHL Network, NHL social media, etc.) that explains to our Players and to our fans why the behavior merited punishment -- or did not. The cumulative effect of these efforts has changed the culture of the game in a positive way. On a nightly basis, we see examples of Players avoiding dangerous plays and gratuitous contact that they no doubt would have engaged in just a few short years ago.

- Fighting: Also to enhance Player safety, two additional Playing Rules relating to fighting were adopted in 2013 by the NHL and NHLPA: Players are now prohibited from removing their helmet before or during a fight. In addition, the minor penalty previously assessed for instigating a fight while wearing a face shield was eliminated. The effect of these Rule changes is two-fold: (i) head and facial protection are now required to be maintained by participants in a fight; and (ii) by "hardening" the target area for Players when they deliver blows in a fight, Players generally are less inclined to engage in this manner.

  While fighting remains a small part of our game, its role is diminishing. Only a small percentage of our Players actually participate in the activity, and they generally do so only with willing combatants. Through 75% of the 2013/14 Regular Season, 632 of the 919 games played (68%) have been completely free of fighting -- the highest such

percentage since 2005/06. In addition, the number of major penalties assessed for fighting is down 15% from last season and down 31% from the 2009/10 season.

The role of fighting continues to be a hot topic in our game and one which engenders a broad spectrum of opinions and debate. As a League, we continue to search for a consensus as to how best to serve the interests of all constituent groups in the game on the issue -- including our fans, our teams, and our Players. To this point, that consensus has proved elusive, including with and as among our Players. In this important area, it would be the League's intention to raise, discuss and negotiate any potential Playing Rules regarding the continued role of fighting in our game directly with the NHLPA.

Playing Environment:

- The League adopted regulations in 1999 and 2001 requiring arenas with tempered glass systems to retrofit their boards and glass systems to meet certain minimum "flexibility" standards that were established in conjunction with outside engineering consultants.

- In 2011, the League mandated a return to acrylic glass from the more rigid (but more spectator friendly) "seamless" or "tempered" glass systems.

- Also in 2011, the League required the redesign and retrofit of "termination points" (poles) positioned near Player and Penalty Bench areas to a curved, impact-absorbing acrylic glass surface that reduces the resistance force applied to a Player's body upon impact. These changes significantly "softened" the playing environment and have enhanced Player safety.

Playing Equipment:

- In 1997, the NHL and the NHLPA adopted a Rule essentially requiring that all Player helmets on a going-forward basis be "certified." While we recognize that hockey helmets and current certification standards are designed primarily to protect Players against skull fractures, not concussions, and that no helmet will likely ever protect athletes against all concussions, we are hopeful that the design and development of helmets and the certification standards related thereto will continue to evolve so as to incorporate metrics and standards dealing with neutralizing the rotational forces associated with a large portion of the concussions suffered in our sport.

- In 2001, the NHL (together with the NHLPA) created an educational publication for Players regarding concussions entitled "Did You Know? Hockey Injuries Can Be Prevented," which emphasized the importance of Players wearing their helmet chin straps properly in order to secure the helmet to the Player's head, advising how "after market modifications" to helmets may increase the possibility of a severe head injury, and advising Players to more frequently replace their helmets to ensure appropriate protection and to avoid the effects of degradation from equipment aging and extensive

travel. This advisory has been updated to stay current with science and has been reissued regularly to all NHL Players in more recent years on an annual basis.

- The League previously adopted, and continues to explore, other equipment-related initiatives in an effort to address the issue of concussions. In 2003, the League, in conjunction with the NHLPA, enacted a requirement that elbow pads have one-half inch of padding on all surface areas that can make contact with an opponent. In 2012, the NHL and the NHLPA formed a joint Protective Equipment Subcommittee to "study and make recommendations with respect to the standards for protective equipment utilized by NHL Players. . . ." One issue currently being explored is whether regulations should be enacted relative to specifications for shoulder pads worn by Players in our League.

- Prior to the start of the 2013/14 season, the NHL (and the NHLPA) instituted a new Playing Rule that mandates the use of face shields by all incoming NHL Players. While targeted specifically to a reduction in eye injuries, the added protection to the upper face and forehead area should also reduce the incidence of head injuries generally.

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To summarize: while recognizing there is considerable work to be done, the National Hockey League has been -- and will remain -- absolutely committed to promoting the safety of its Players. We firmly believe it is not only the "right" thing to do for our Players but it is the "right" thing to do for our business -- both in terms of promoting participation at the youth hockey level and in maximizing interest by fans and consumers of the sport at the professional level.

Again, I thank the Chairman, the Ranking Member and the Subcommittee Members for your time and your invitation to speak.

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Mr. TERRY. Thank you. Mr. Ogrean, you are recognized for your 5 minutes.

STATEMENT OF DAVE OGREAN

Mr. OGREAN. Thank you, Chairman Terry, Ranking Member Schakowsky, and distinguished members of the subcommittee. It is a privilege to be with you today to discuss an issue that is the top priority every day at USA Hockey, and that is the safety of our participants both on and off the ice.

We have adapted well to changing environments over time, and we have two particular leaders that we wish to thank, and who guide a great deal of our decision-making. One is Dr. Mike Stewart, our Chief Medical Officer, who is the head of sports medicine at the Mayo Clinic in Rochester, Minnesota, the other is Dr. Alan Ashare from Saint Elizabeth's Medical Center in Boston, who is also the chair of our Safety and Protective Equipment Committee. That committee has been in existence at USA Hockey for 40 years, and it is an important group helping to guide our Board in making its decisions.

We have a Risk Management Committee which is concerned with the safety of the playing environment and the surrounding area, and in 1999, in cooperation with U.S. Figure Skating, we began an organization called Serving the American Rinks, or STAR, which is essentially a trade and education organization for ice facilities, focusing on a variety of operational aspects, including safety issues in rinks.

In terms of the safety of our participants, we believe we can and do positively affect the landscape through 3 primary areas; education, rules and rules enforcement, and risk management. Education related to safety happens on an ongoing basis at USA Hockey, and we utilize many avenues to communicate. We have, very fortunately, direct electronic communication with every single home, every player, every parent, every official and every coach in our organization, through our database. We are constantly in communication with them with educational bulletins and news. Our coaches have a huge influence in providing a safe and responsible environment, and our coaching education program has long been heralded in the amateur sports world as the gold standard for coaching education.

As Congressman Terry referenced, this last year—or, excuse me, two seasons ago—we added an online educational module that is age-specific in nature, which also contains critical safety information, including concussion education. Officials, obviously, play a very important part in how our game is made safe as well, and they receive regular evaluation and education electronically, and are sent video clips and also access to our national reporting system which tracks penalties, to help us understand and assess behavior trends. We annually mail posters to every ice facility in the country to help deliver our messaging, and, over the years, those posters have focused on topics including concussion prevention, concussion education, playing rules emphases, and our heads-up, don't duck program, to name a few.

As for rules and rules enforcement, we have modified our rules to adapt to the evolving landscape of the game on an ongoing basis,

from mouth guard and helmet issues to rules aimed at eliminating dangerous behavior. Another recent modification in USA Hockey came in June of 2011 when our Board voted to change the allowable age for body checking in games from the peewee, or age 11 and 12 level, up to the bantam age group of 13 and 14. This was done despite many voices around the country in opposition to change, which nobody seems to like, but research based on both athlete development and safety guided our Board decision. It is worth noting that 2 years later, Hockey Canada followed our lead.

Regarding equipment and its impact on safety, USA Hockey took a significant step in 1978 when it called for the creation of the Hockey Equipment Certification Council, or HECC. HECC's mission is to seek out, evaluate and select standards and testing procedures for hockey equipment for the purpose of product certification. It is very similar to NOCSAE, which a lot of you may be familiar with, that football uses in certifying its helmets. It is a completely independent body made up of attorneys, doctors, engineers, manufacturers, testers and sportspeople. It validates the manufacturer's certification that the equipment they produce has been tested, and meets the requirements of the most appropriate performance standards, and it has been an important part of our safety story for 35 years.

Before closing, I would like to share with you briefly our newest off-ice safety program called USA Hockey Safe Sport, following the lead of the United States Olympic Committee, this is to protect our participants and educate on policies regarding hazing zero tolerance, locker room supervision, and abuse of any kind. In the early 1990s, we were one of the very first youth sports organizations to require screening of all adults that have regular access to our youth participants. We follow-up on 100 percent of calls we receive around the country of alleged abuse, and our 34 affiliate associations each have a volunteer safe sport coordinator that helps us as boots on the ground to provide the safest possible environment for our participants.

Our sport has enjoyed tremendous growth in the last 25 years, more than doubling in the number of youth players that we have. As we continue to provide opportunities for young people, we know that in doing so, we have the responsibility to make our game as safe as possible, and will only continue to grow if we are successful in doing so.

Thank you.

[The prepared statement of Mr. Ogrean follows:]

Statement of Dave Ogrean, Executive Director of USA Hockey
Before The House Committee on Energy and Commerce
Subcommittee on Commerce, Manufacturing and Trade

March 13, 2014

Thank you Chairman Terry, ranking member Schakowsky and distinguished members of the sub-committee. It is a privilege to be here with you today to discuss an issue that is the top priority every day at USA Hockey and that is the safety of our participants – both on and off the ice.

We've adapted well to changing environments over the history of our organization and been fortunate to have had the leadership in the area of safety of our current president, Ron DeGregorio; our chief medical officer, Dr. Michael Stuart from the Mayo Clinic in Rochester, Minnesota; and the chair of our Safety and Protective Committee, Dr. Alan Ashare from St. Elizabeth's Medical Center in Boston, to name just a few.

We began our Safety and Protective Equipment Committee some 40 years ago and it has been an important group to help guide our Board on safety issues ever since. We also have a Risk Management Committee to assist in providing solutions related to

safety of the physical playing environment. In addition, USA Hockey, together with U.S. Figure Skating, started an organization called Serving the American Rinks, or STAR, in 1999. It is essentially a trade organization to assist rinks in all facets of rink operation, including safety issues.

In terms of the safety of our participants, we believe we can positively affect the landscape through three primary areas, 1) education, 2) rules and rules enforcement, and 3) risk management, including equipment and facilities.

Education related to safety happens on an on-going basis at USA Hockey and we utilize many avenues to help communicate with appropriate audiences.

We have direct electronic contact with players, parents, coaches and officials through email and we're in regular communication on a variety of topics with all groups. Our coaches have an enormous influence in creating a safe and responsible environment for our youth players. We've long been credited with having developed the gold-standard coaching education program among youth sports organizations, and we took another step forward with the start of the 2011-12 season by requiring coaches to complete an online education module specific to the age group they're coaching. These modules include not only pertinent development information, but critical safety information, including concussion education. Officials also play an important role in the safety of the game and our officiating education program

includes on-going and regular evaluation and education. Video clips are sent to officials throughout the year to highlight proper rules enforcement and we also have a nationwide reporting system in place to track penalties to help us understand and assess behavior trends of players on the ice.

We also annually mail posters to every rink in the country to help deliver our messaging. Over the years, these posters have focused on topics such as concussion education; rules emphasis; and our *Heads Up, Don't Duck* program to name a few.

I'd like to touch briefly on *Heads Up, Don't Duck*, which was implemented in 1996 thanks to the leadership of Dr. Ashare. *Heads Up, Don't Duck*, which is part of our on-going coaching education curriculum, teaches kids to keep their heads up when they go into the boards or goalpost, with the objective of preventing head and spinal cord injuries. It has been a very important part of our landscape and a program emulated by other sports.

As for rules and rules enforcement, we have modified our rules to adapt to the evolving landscape of the game on an on-going basis, from mouth guard and helmet issues to rules aimed at eliminating dangerous behavior, including our Standard of Play initiative that was launched in 2009-10. Another recent modification USA Hockey made came in June of 2011 when our Board voted to change the allowable

age for checking in games from the Peewee level, which is for players ages 11 and 12, to the Bantam age group, which includes players ages 13 and 14. This was done despite many voices across the country in opposition, but research based on both athlete development and safety guided our Board in making that decision. It is worth noting that two years later, Canada followed our lead.

Related to equipment and its impact on safety, USA Hockey took a significant step in 1978 when it called for the creation of the Hockey Equipment Certification Council. HECC's mission is to seek out, evaluate and select standards and testing procedures for hockey equipment for the purpose of product certification. It is a completely independent body. The HECC certification program validates the manufacturers' certification that the equipment they produce has been tested and meets the requirements of the most appropriate performance standards. It has been an extremely valuable body that has taken its role seriously and has been an important part of the safety story in our sport for over 35 years.

Before closing, I'd like to share with you our off-ice safety program, called USA Hockey SafeSport. We've long had rules in place to protect our participants -- from codes of conduct applicable to administrators, coaches, officials, parents, players and spectators, to policies on hazing, zero tolerance, locker room supervision and abuse of any kind. In addition, in the early 1990s, we were one of the very first youth sports organizations to require screening of adults that have access to our

youth participants. USA Hockey SafeSport, which was approved by our Board in 2012, essentially has taken all of our off-ice safety initiatives and packaged and strengthened them under the brand of USA Hockey Safesport. Today we have a more streamlined reporting system for alleged abuse and protection for whistleblowers. We follow up on 100 percent of the calls we get with reports of alleged abuse of any kind, and our 34 affiliate associations around the country, each with a volunteer SafeSport coordinator, do an excellent job as partners with us in providing the safest possible environment for our participants.

Our sport has enjoyed tremendous growth at all levels – in particular at the youth level – over the course of the last 25 years. Today, hockey is played in all 50 states, with some 350,000 youth players, whereas in 1991, just over 160,000 kids were playing the sport. According to multiple studies, hockey and lacrosse are today the only two youth sports consistently growing in numbers. That growth is due to many factors, including the unsung heroes of our sport, those being the tens of thousands of volunteers across the country that donate their time in many capacities to make grassroots hockey the great option it is for families today. As we continue to provide opportunities for young people to get involved in playing our sport, safety will remain the top priority in our organization.

Thanks again for the invitation to be here today.

Mr. TERRY. Thank you. Mr. Miller, you are recognized for your 5 minutes.

STATEMENT OF JEFF MILLER

Mr. MILLER. Chairman Terry, Ranking Member Schakowsky, members of the subcommittee, appreciate the opportunity to testify this morning on behalf of the National Football League on an issue of great importance to the league, and I commend the committee for taking up this issue.

There is nothing more important to the NFL than the safety of our players. Commissioner Goodell has stated repeatedly in the past that he spends more time on the health and safety of our sport than any other issue that comes before him.

Football has earned a vital place in the rhythm of American life. There are nearly 6 million kids who play tackle or flag football across our country, another 1.1 million that play in high school, 75,000 in college. And so whether it is touch games in our backyards at Thanksgiving, or games played in our local parks by our kids, or Friday night high school games, Saturdays with college, or hopefully plenty of people watching the NFL on Sundays and Mondays, and occasionally Thursdays, football plays a significant role in our lives, and we take that popularity seriously. With it comes a great deal of responsibility, and that is one that we embrace.

We understand the decisions that we make at our level affect football at all levels, and probably far beyond that, and so I appreciate the opportunity to share the NFL's work with the subcommittee on the health and safety of our athletes who play our game.

Now, football has always evolved. The rules have always changed, and so I would like to share with the subcommittee a few examples of that over the last couple of years, and the impact that that has had at our level.

It has only been a couple of years ago that we changed the kickoff line at the NFL, moving it forward 5 yards. We did that because we had identified the kickoff and the kickoff return is the single most dangerous play in our sport as related to the number of concussions. So by moving it forward 5 yards, we decreased the number of concussions on that particular play by 40 percent. That was in the first year alone, and that number has stayed steady in successive years.

In addition, for those of you who are fans, you have seen a greater emphasis on eliminating helmet-to-helmet hits in our game, you have seen a greater emphasis on eliminating the use of the crown of the helmet in our game, and you have seen fines and suspensions, not to mention penalties, as a result of them. And these are the sorts of things that we are looking to do to change the culture of how our sport is played. We have encouraged players to lower their target zones as they tackle, we have emphasized through our coaching that there are better ways to go about what they are doing, and we have seen the results. In the past year alone, between 2012 and 2013, the NFL has seen a decrease in the number of concussions at our level by 13 percent. A decrease in helmet-to-helmet hits causing concussions has been down 23 percent in one year alone. Now, that is not a victory, that is a trend, and one that

we find encouraging, but there is more work to be done as we begin to change the culture of the sport as it relates to that.

And we have added other protocols to our sideline to take care of our players. There is one rule that governs us, and that is that medical concerns will always trump competitive ones. So we have added unaffiliated neurotrauma consultants on the sideline. That is a concussion expert in every city to help the team physician identify concussions and treat the players. We have added athletic trainers in skyboxes for the sole purpose of watching the game, and calling down to the sideline if they identify an injury, concussive or otherwise, to make sure that the player is attended to appropriately. And we have mandated uniform sideline protocols across all 32 of our teams so that everybody is working off the same playbook, and those protocols are based on internationally accepted medical guidelines. We would expect nothing less. And we know as we change the culture of our sport as it relates to health and safety, we have an impact far beyond. And so let me cite two examples of that for the subcommittee. One is our support for USA Football, and you will hear from Mr. Hallenbeck in a moment. Their Heads-up Program, among their other offerings, are changing the game in our parks, in our communities around the country literally as we speak. The popularity of these programs, which I won't steal Scott's thunder on, have been tremendous, and the NFL is a proud supporter of USA Football, and will continue to be in all that they do to change the game, and we are proud of his work particularly.

In addition, the NFL used as inspiration a young child named Zackery Lystedt who was a 13-year-old youth football player in Washington State several years ago who suffered catastrophic injuries playing his sport. He was returned to play too soon after suffering a concussion. And Zackery still struggles with the challenges that come from that. His advocates were able to pass a Youth Concussion Law in Washington State which our commissioner said we will replicate in all 50 States around this country to make sure that all youth sports, not just football, are played more safely, that kids and their coaches are aware of the risks of concussion, that they are removed from play should it appear that they suffer concussion, and most importantly, not return to play until a medical professional has cleared them. Just this past month, we are proud to say that the fiftieth State passed that law, and now the NFL isn't solely responsible for that work, but we are happy to lead and to be in many of these States to get this done.

And as my time expires, let me just mention two other quick components. We have been proud to work with the CDC promoting concussion materials that have gone out to millions of kids, posters in locker rooms, and to fund much of their Heads-up Program. We have also invested tens of millions of dollars in research; $30 million with the NIH, which is the largest grant that the NFL had ever given, and the first $12 million of that has gone out already to study chronic traumatic encephalopathy. In addition, we are very proud of a $60 million effort we have with General Electric and Under Armour, both to improve the diagnosis and prognosis of concussion by developing better tools, and then secondly to find better ways to protect against concussion in the first place. These

are ongoing issues and ones that we think are going to yield significant successes in a short time.

So I apologize for exceeding my limit, Mr. Chairman, but I appreciate the time.

[The prepared statement of Mr. Miller follows:]

TESTIMONY OF JEFF MILLER

SENIOR VICE PRESIDENT, NATIONAL FOOTBALL LEAGUE

BEFORE THE

SUBCOMMITTEE ON COMMERCE, MANUFACTURING AND TRADE

OF THE

COMMITTEE ON ENERGY AND COMMERCE

UNITED STATES HOUSE OF REPRESENTATIVES

MARCH 13, 2014

Mr. Chairman, Ranking Member Schakowsky, members of the subcommittee, thank you for inviting me to testify today. My name is Jeff Miller. I am the Senior Vice President for Health and Safety Policy at the National Football League. I appreciate the opportunity to testify before you on a topic of significant importance: "Improving Sports Safety: A Multifaceted Approach".

There is nothing more important to the NFL than the safety of our players. Commissioner Goodell has stated repeatedly that he spends more time on the health and safety of our sport than any other issue. And, there is no issue of greater importance when it comes to player safety than the effective prevention, diagnosis and treatment of concussions.

Football has earned a vital place in the rhythm of American life. Nearly 6 million kids play flag or tackle football; another 1.1 million play football in high school; and 75,000 play in college. Whether it is touch games in our backyards with family, youth games played in our local parks, Friday night high school games, college games on Saturdays, or Sundays and Mondays spent rooting for favorite NFL teams, football plays a significant role in our lives.

With that popularity comes responsibility. One that we embrace and take seriously. We understand that the decisions we make at the NFL level impact football at all levels, and have influence even beyond that. I appreciate the opportunity to share the NFL's work to promote the health and safety of the athletes who play our game, as well as athletes of all sports, and at all levels.

The game of football has always evolved and become more exciting and safer along the way. President Roosevelt's intervention in college football in 1905 when 18 athletes died led to the adoption of the forward pass and the development of the NCAA. As a result, the game improved, became more popular, and safer. Over the decades, the helmet became required equipment, going from leather to a hard shell, and improving its safety capabilities with every new version. The introduction of the facemask added further protection. Pads to protect the knees, hips and thighs became a part of the uniform as well.

Our efforts to promote sports safety go far beyond head injuries and far beyond football. We work to ensure everyone who plays the game or has played the game receive the best possible medical care. This includes not only youth football players, but also the many retired NFL players pursuing different careers and interests long after they leave the playing field behind. We are pleased that retired players are living productive and healthy lives.

In 2012, a NIOSH study found that former NFL players are likely to live longer than men in the general population. Former players also had a lower rate of cancer-related and heart disease related deaths. For those players who do experience medical challenges, the NFL 88 Plan has distributed almost $30 million since 2007 to former players for assistance with for dementia, ALS and other neurodegenerative diseases. In addition to the 88 Plan, we also have comprehensive disability plan; long-term care insurance; joint replacement surgery; and players now have the opportunity to remain in the NFL medical plan post-career.

In 2012, we established the NFL Life Line as a free, independent and confidential phone consultation service and website. All members of the NFL family have complete access to the Life Line and its staff of trained mental health experts 24 hours a day, every day of the year.

The NFL Player Care Foundation provides resources for former players to take care of their mental and physical well-being. Next week, former players will congregate in Orlando as part of the PCF's Healthy Body and Mind program, which takes place nationwide. The free national screening program is open to all former NFL players, and includes a series of private and confidential cardiovascular and prostate screenings, along with mental health resources and education.

Fostering a strong culture of player health, wellness and safety – that extends across all aspects of a player's life, from his football career to his family and personal growth– is a focal point for the NFL. Players are provided resources, tools and support to assist them as they move through their careers and lives, from signing with their first NFL team to having their first child to adjust to life post-football.

Rule Changes

Over time, the playing rules of our game have evolved. The head slap, the leg whip, the cut block and the horse collar tackle, among many other techniques can only be seen in historical videos.

In recent years, the playing rules continue to be modified in an effort to reduce contact to the head and neck. One very specific example of how this effort has made the game safer is the decision to move the kickoff line forward five yards. The kickoff return yielded more concussions than any other play in our game. By moving the kickoff, concussions declined 40% in the first year and have remained at that lower level since. Additionally, the rules offer a more expansive definition of what constitutes a defenseless player, therefore protecting more players from dangerous hits in more circumstances. Penalties, fines, and in some cases suspensions are reducing helmet to helmet hits as we work to remove those practices from our game. Just last season, we adopted a rule banning tacklers and ball carriers from initiating contact with the crown of the helmet. Often these changes are met initially with criticism from fans or players, but these modifications make the game safer while keeping it exciting. We will continue to look for ways to take unnecessary and dangerous plays out of the game.

According to our most recent injury data, these changes are making an impact. Concussions are down 13 percent and concussions from helmet to helmet hits are down 23 percent between 2012 and 2013. We believe this is a result of rules changes, a culture change, the enforcement of the rules and our focus on limiting the use of the head in our game. Coaches are teaching players different techniques and experts who study the game, like former coach John Madden, believe that players are lowering their target when they tackle and are hitting the head less often. These statistics only represent one year's experience but we are encouraged by the direction. At the same time, we have not seen any increase in knee injuries as a result of lower targeting.

Rules are an essential part of the continued evolution of our game. Importantly, as the NFL adopts new rules, we frequently see those changes quickly replicated in college and high schools. This drives a culture of safety throughout our sport.

Protocols and Treatment

When players are injured, we take their care very seriously and act conservatively, especially as it relates to possible head injuries. The first rule that we follow in all cases is that medical decisions take precedence over competitive ones.

In recent years, we have made significant improvements to our practices and protocols to better identify and manage injuries.

First, we added an athletic trainer to a skybox in every stadium for the sole purpose of identifying possible injuries. Where a player looks as if he may be injured, the athletic trainer relays that information to the team medical staff. This "eye in the sky" helps ensure that injuries are quickly identified and that players receive prompt medical attention. Second, the medical staff now has available the actual video of the play on which the injury occurred; they can watch that video on the sidelines almost immediately to better understand what happened on the field and how the injury occurred. This is a most valuable aid in diagnosis and helps team medical personnel make better treatment decisions. Third, with respect specifically to concussions, several special protocols are in place. Players who may have sustained a concussion are removed from the game or practice and examined by trained medical professionals. Anyone who has sustained a concussion may not return to play that game under any circumstances. A player who may be showing signs or symptoms of a concussion is taken to the locker room away from the noise and the lights of a packed stadium. There, a doctor can perform a full exam.

The sideline review is a standardized exam, consistent across all 32 teams, and is based on internationally accepted medical standards. This year, team medical personnel were aided by unaffiliated neurological consultants in making concussion diagnosis. These doctors, local concussion experts, have no relationship with a club and are there solely to offer their expertise

and a lending hand where one is needed. We were very pleased with the program in its first year and will use it again this coming season.

If a player is diagnosed with a concussion, he may not return to play or practice until he completes a graduated protocol involving periods of rest, examination and exercise challenges, and has been cleared by his team neurological expert as well as an independent expert identified in consultation with the players association.

Players know more about concussive injuries than they have ever before In each locker room is a fact sheet and poster designed to educate players, coaches and others at our team on concussions – what they are, what symptoms to look for, and what to do if a player suspects that he or a teammate has had a concussion. We worked closely on the poster and fact sheet with the Centers for Disease Control and Prevention. Working with the CDC and others, we have helped to design a complimentary version for all youth and high school sports, which is freely available on the CDC's website. According to the CDC, it is one of their most popular offerings and has been downloaded more than a million times.

Youth Sports Participation and Youth Football Participation

The NFL takes its responsibility as a leader very seriously. For that reason, we are concerned not just about our athletes or football generally, but about the public health issue that concussions present. Possibly related, we are also aware of the significant decline in youth participation rates in team sports.

The diagnosis of concussions in youth sports has increased fourfold in 11 years -- at a rate of 15 percent a year. Some of this is due to increased awareness of the risks and signs of a concussion; some is as a result of a broader definition of concussion.

This may also be related to the 15% decline in team sports participation in the last several years, according to the Sports and Fitness Industry Association ("SFIA"). According to the Wall Street Journal, citing the SFIA, the decline in youth tackle football participation is considerably less than in other sports like soccer, baseball and basketball. Nevertheless, it is declining.

Experts in this area cite sports specialization, safety, economics and a decline in recreational options for athletes all as reasons for the decline.

This is a societal problem. One we commend the committee for investigating and for raising the profile of the issue. Team sports bring great benefits to our children. Teamwork, communication, resilience, hard work, perseverance, social skills, as well as learning to win and lose are just some of the character developing attributes we know that sports help teach our kids. When these attributes of sports are combined with studies that show athletes perform better in school and have fewer attention and discipline problems, it is easy to see a decrease in participation as particularly problematic for our society. This calculation does not even consider the dangerous trend of childhood obesity that is challenging our young people.

We believe that the NFL has a responsibility to address this challenge, especially to the extent safety is an element driving kids away from participating -- or driving parents away from letting their kids play.

One place where we are focusing our efforts is on the future of youth football. It is essential that as professional football evolves so does the game at all levels. For the almost 6 million kids who play football, we are proud to work with USA Football to support their efforts to make an already great game even better. You will hear from the Executive Director of USA Football, Scott Hallenbeck, about his organization's efforts to promote youth participation and make the game better and safer, so my comments will be limited.

The NFL and our players association created USA Football 11 years ago in an effort to promote youth football and improve the game. They have done just that.

Last year, we supported the pilot offering of a program called "Heads Up Football" that was designed to improve the game at the youth level. The core elements of the program are: coaching certification, the addition of player safety coaches, proper equipment fitting, concussion and other health education, and parental involvement.

For the first time, coaches were being asked to take an educational course to teach them how to teach the game. The program was developed by and focuses on teaching the right

techniques, playing the game safely, and on attributes like respect and good sportsmanship. Creating standards for coaches and insisting on compliance will result in better trained adults on the sideline and better coaching being delivered to the kids. Further, where the game is being taught appropriately, the game will be safer, and more enjoyable for those who play it.

This pilot program found enormous demand in its first year, including four youth leagues in Nebraska. This year the NFL will continue to support USA Football's efforts to grow Heads Up Football to become the standard for youth football participation across all youth leagues. We are particularly proud that Pop Warner will mandate Heads Up Football for all of its participants this year for the first time. Pop Warner deserves great credit for taking the lead on football safety.

The NFL supports the Heads Up program as it begins its pilot program in high schools across the country. Already, the National Federation of High Schools, the national PTA, the National Athletic Trainers Association, as well as many college conferences have endorsed Heads Up Football as an appropriate way to teach the game. The NFL is proud of the progress of this program and looks forward to USA Football's efforts to make the game even better and safer.

Lystedt Laws

Beyond our efforts to promote and improve the game at all levels, the NFL is proud of our efforts to promote youth concussion laws across the countries to make athletes in all sports safer.

In October 2010, the NFL, Seattle Seahawks, Centers for Disease Control and the U.S. Army held a conference to discuss concussions in youth sports. The conference celebrated the efforts of influential representatives of the Seattle medical, legal and political communities to pass a unique law to make youth sports safer.

The legislative effort was inspired by Zackery Lystedt's courageous story. As a 13-year old football player, Zackery suffered tragic injuries in a football game. During his recovery, Zackery became the inspiration for legislation passed in Washington State that would become a model for youth sports concussion laws passed around the country.

At that conference, NFL Commissioner Roger Goodell announced that the NFL would adopt Washington State's Lystedt law, which had then passed in six states, as a cause and commit to advocating for its passage in ten states in the next year and the eventually all fifty states. The Lystedt law contains three key components:

1. Youth athletes and their parents must be educated about concussions each year.
2. If a young athlete is suspected of sustaining a concussion, he or she must be removed from the practice or game.
3. The youth athlete cannot return to play until he or she has been cleared by a licensed health care provider.

Earlier this year, the NFL achieved its goal and as of today all fifty states have passed laws addressing concussion in youth sports. As a result, youth athletes in all sports are safer and parents, coaches and teachers are more aware of concussion diagnosis and treatment than ever before. Since the passage of these laws, some states have returned to the issue to strengthen the statutes even further.

Partnerships

The NFL's efforts to make sports safer go beyond head injuries and goes far beyond football. For several years, we have been proud to support the Korey Stringer Institute in their efforts to prevent heat related illness in sports around the country. These complete preventable deaths are among the leading causes of fatalities in youth sports. The correct protocols and increased awareness will stop these tragic events. The Korey Stringer Institute has been successful in gaining acceptance of heat acclimatization practices in several states already. We will work with them to spread those best practices even further.

Similarly, we are proud of a partnership with the national PTA. Last year, the NFL and the National PTA launched a nationwide partnership on youth health and fitness. The "Back to Sports" initiative provides parents and communities with important youth wellness information the importance of physical activity. Through this partnership, local PTA's provide their

communities with important information at "Back to Sports Nights". We are looking to expand upon this partnership this year.

The NFL has worked closely with the CDC since 2007 to promote concussion awareness for young athletes. The NFL's work with the CDC has resulted in multiple resources through the CDC's Heads Up campaign. The Heads Up campaign provides important information about concussion in sports for youth athletes, their coaches and parents, and health care professionals.

U.S. Army

One other collaboration that we are very proud to discuss is our relationship with the U.S. Army. In 2012, the NFL and the U.S. Army partnered to improve education and awareness of head injury among NFL players and service members. This partnership focuses on shared culture change, information exchange, education, and increased awareness of the issues surrounding concussion. The initiative provides an opportunity for the NFL and members of the armed forces to collaborate to change their cultures and address barriers that discourage the reporting of concussion symptoms. Since the establishment of this partnership, the NFL and the U.S. Army have co-hosted forums at NFL team facilities and Army bases to permit players and soldiers together to share experiences and discuss concussion awareness and culture change.

Scientific Research

While we are working to make sports safer through a number of efforts already described, it is also important to identify the goals of the significant medical research that the NFL's owners have chosen to fund. The tens of millions of dollars already announced are designed to move science forward and make real differences in the medical understanding of the issues being researched. We hope, of course, that football will be safer as a result; but equally importantly, there will be societal benefits to the breakthroughs and innovations being created with the NFL's and our partners' contributions.

National Institutes of Health

In September of 2012, we joined with the experts at the National Institutes of Health to advance the science behind head injuries, providing them with $30 million in funding for medical research to the Foundation for the National Institutes of Health (FNIH).

The unrestricted gift is the NFL's single-largest donation to any organization in the league's 92-year history, demonstrating just how strongly we believe in the pursuit of medical research that will benefit not just NFL players, not just athletes, but the general population as well.

Some areas of research to be funded by our grant include chronic traumatic encephalopathy (CTE); concussion management and treatment; and the understanding of the potential relationship between traumatic brain injury and late-life neurodegenerative disorders, especially Alzheimer's disease.

The funding has already helped support important research projects. In December of last year, the NIH announced its first round of grants to eight institutions for the study of traumatic brain injury. In addition, the NIH announced funding for six pilot projects in sports-related concussions.

Traumatic brain injury is the leading cause of death in young adults. We are proud that our support will play a role in studying this injury and helping the brightest minds in the country to learn more about its causes, its treatment and its long term effects.

Head Health Initiative

In March of last year, we announced with GE the Head Health Initiative, a four-year, $60 million collaboration to speed diagnosis and improve treatment for mild traumatic brain injury. The goal of the research and innovation program is to improve the safety of athletes, members of the military and society overall.

The initiative includes a four-year, $40 million research and development program to evaluate and develop next generation imaging technologies to improve diagnosis that would allow for targeting treatment therapy for patients with mild traumatic brain injury.

In addition to the research program, the NFL is partnering with GE and Under Armour to launch the Head Health Challenge, which has two focus areas that seek new solutions for understanding mild traumatic brain injury. The organizations are pledging to find and fund ideas that accelerate solutions for brain protection. The challenge fund could invest up to $20 million.

We received more than 400 submissions from people in 27 countries to the first innovation challenge. All of these ideas were directed toward better ways to diagnose brain injury. In January, with GE, we presented 16 winners from around the world, $300,000 each with an opportunity to win another $500,000 in the next year. The expert judges from the military, NIH and others believe that the 16 winners all have a realistic chance to make a difference in the diagnosis and prognosis of traumatic brain injury in a short time.

The second challenge which focused on methods for protecting the brain from injury, recently closed. This challenge was even more popular. The website received more than 40,000 visitors from more than 100 countries. In the end, inventors, entrepreneurs, academics and others submitted more than 450 ideas representing 19 different countries around the world. We are reviewing the submissions now with the intent of making awards this September.

Mr. Chairman, this is a brief summary of the efforts that the NFL is making to improve sports safety. I have also attached the NFL's 2013 annual health and safety report. We look forward to engaging with your committee to these ends.

Thank you.

Mr. TERRY. At this time, Mr. Hallenbeck, you are recognized for your 5 minutes.

STATEMENT OF SCOTT HALLENBECK

Mr. HALLENBECK. Chairman Terry and members of the committee, thank you for the invitation to testify.

USA Football creates and directs programs and resources that establish important standards rooted in education for youth and high school football. We stand with experts in medicine, child advocacy and sport who believe that education changes behavior for the better. This is precisely what we are seeing through our Heads Up Football program, which is already benefiting more than 25 percent of youth football leagues across the country in its first 14 months, and we expect to double that this year.

We advance safety through evidence-based studies by independent experts, we also lead fun and dynamic instructional football initiatives for young players, as well as a national non-contact flag football program. More on these and other aspects of our work resides in my written testimony. The remainder of my time will be showing a video of how Heads Up Football High School Pilot Program is improving player safety within the Fairfax County Public School system, which earned high marks from parents, coaches, administrators in its first season. It paid close attention to hearing from the athletic directors and the principals and the superintendents of the schools on how this program is making a difference.

[Video shown.]

[The prepared statement of Mr. Hallenbeck follows:]

Testimony of

Scott Hallenbeck
Executive Director
USA Football

Before the House Subcommittee on Commerce, Manufacturing and Trade

"Improving Sports Safety: A Multifaceted Approach"

March 13, 2014

Chairman Terry and Members of the Committee:

My name is Scott Hallenbeck. I am the executive director of USA Football, the sport's national governing body.

More than 4.5 million American children enjoy the fitness, social and academic benefits of playing youth and high school football.

USA Football, based in Indianapolis, is an independent non-profit organization with members residing in all 50 states and the District of Columbia. Our members are youth and high school football coaches, players, parents, school district and youth league administrators and football game officials. As the sport's national governing body, it is our responsibility to lead and serve the youth and high school football community. USA Football was endowed by the National Football League (NFL) and the NFL Players Association (NFLPA) in 2002 through the NFL Youth Football Fund. Our office partners with more than two dozen organizations who endorse and/or support our work for the betterment of youth athletes' safety, spanning medicine, child advocacy and multiple levels of sport, from youth, high school, collegiate and professional levels. I have served as USA Football's executive director since 2005.

In 2008, USA Football became our country's first national governing body of sport – and one of 26 youth sports and child advocacy organizations – to participate in the CDC's Heads Up Concussion in Youth Sports initiative. Today we continue to join with the CDC and other medical experts, including our medical advisory committee, composed of medical experts with a diverse range of expertise including orthopedics, sports medicine, neurological injury, rehabilitation medicine, athletic training, sports cardiology, hydration and environmental issues and exercise science, to advance player safety.

We believe in a holistic approach to teaching football. We agree with medical experts who state that education delivers behavior change to advance the safety of our young athletes.

USA Football's Heads Up Football Program

USA Football's Heads Up Football[SM] program is a comprehensive approach to a better and safer game. Heads Up Football includes six primary elements:

Coaching education	• Coaches within a youth program are trained to teach the game's fundamentals by completing USA Football's nationally accredited Level 1 Coaching Certification Course. High school coaches will gain training through USA Football's High School Coach Certification course. Developed in partnership with the National Federation of State High School Associations.
Equipment fitting	• Coaches, parents and players are taught proper helmet and shoulder pad fitting.
Concussion recognition and response	• Coaches learn and are assessed on CDC concussion recognition and response protocols through USA Football's Level 1 Coaching Certification Course. • Coaches, parents and players are taught CDC concussion-related protocols.
Heat and hydration	• Coaches, parents and players are taught heat and hydration safety measures set forth by the University of Connecticut's Korey Stringer Institute.
Heads Up Tackling	• USA Football's Heads Up Tackling technique, endorsed by medical and football experts, which teaches to keep the head up to reduce helmet contact for safer play.
Player Safety Coach	• Appointed by a participating Heads Up Football youth organization or high school, this individual ensures compliance with Heads Up Football's player safety protocols, coach certification, and the conducting of safety clinics for coaches, parents and players.

Nearly 2,800 youth leagues across the United States registered for Heads Up Football in 2013, accounting for more than 25 percent of the youth football community. In addition, 35 high schools in 10 states piloted Heads Up Football during the 2013 season. USA Football will offer its Heads Up Football program to all youth leagues and high schools this year as we strive to establish the teaching of consistent technique and terminology from youth through high school football.

The Fairfax County (Va.) Public School District was the first in the country to adopt USA Football's Heads Up Football program in each of its twenty-five high schools and expressed very favorable results. A video (4:20 in length) capturing the reaction of the parents, coaches, athletic trainers

and administrators to the program's first year may be viewed here: https://www.youtube.com/watch?v=uYExUhGKxB4.

In addition to Fairfax County Public Schools, a number of school districts and state high school athletic associations have reached our nonprofit office to learn more about Heads Up Football. We estimate that between 500 and 1,000 high schools will adopt our Heads Up Football program in 2014.

USA Football has trained more than 110,000 youth and high school coaches through its online course. USA Football's Level 1 Coach Certification Courses (one for tackle football, another for flag football) are the first and only football coaching education courses to earn national accreditation from the National Council for Accreditation of Coaching Education (NCACE).

> "The NCACE recognizes USA Football's exceptional work in providing high-quality coaching education and delivering it in a compelling format. USA Football successfully melds how to teach football's fundamentals and advance player safety while promoting the game's inherent team-first values. More sports organizations would do well to view USA Football's courses as a model for what theirs can be."
>
> --NCACE Executive Director Christopher Hickey

This month, USA Football will release a coach certification course tailored for high school coaches.

Medical experts have endorsed the Heads Up Football program. In their own voices, the following are a sample of comments regarding USA Football's Heads up Football program for safer play:

> "I think this overall approach and the specific techniques within the program are exactly the next steps we need to take to improve head safety in tackle football. The effort to teach effective, yet safe tackling and blocking techniques at the earliest youth levels can only have positive downstream benefits for our players at the high school, college and professional levels ... These efforts should lead to a reduction in the factors that result in concussions."
>
> --Dr. Gerard A. Gioia, pediatric neuropsychologist, Children's National Medical Center

# # #

"I like it. It's short and to the point, and most importantly – teaches the key fundamentals of keeping the head up, while using the legs, hips, chest, and arms for safe and effective tackling. I have shown it to my two sons who are currently playing football, and I think it will positively influence the way they play the game. "

--Dr. Kevin Guskiewicz, Co-Director, Matthew Gfeller Sport-Related TBI Research Center
Chair, Department of Exercise and Sport Science Chair, University of North Carolina at Chapel Hill

# # #

"As a team physician with a specific interest in head and neck injury who has cared for football players for three decades, I find this USA Football offering to be very valuable in helping to make players on the field better and safer. This well thought out approach is a huge step forward for safer football participation by protecting the head and cervical spine during tackling. Also, introducing this proper tackling technique early in a player's career is essential to its success.

"Avoiding unnecessary head contact is a major part of concussion and cervical spine injury prevention teaching in the medical and sports communities, and this program is the best (by far) of any I have seen. The program is ground breaking, well designed and very timely."

--Dr. Stanley A. Herring, Director, Sports Spine and Orthopaedic Health
University of Washington Medicine

Some of the medical and sport backers of USA Football's Heads Up Football program include:

- Amateur Athletic Union
- American College of Sports Medicine
- American Football Coaches Assoc.
- Arizona Coaches Association
- Atlantic Coast Conference
- Big 12 Conference
- Big Ten Conference
- Indiana Football Coaches Assoc.
- Korey Stringer Institute
- Maxwell Football Club
- Michigan H.S. Football Coaches Assoc.
- Minnesota Football Coaches Assoc.
- National Athletic Trainers Assoc.
- NATA Research & Education Foundation
- National Fed. of State High School Assoc.
- National Football League
- National Parent Teacher Assoc.
- National Police Athletic League
- NFL Alumni Association
- NFL Head, Neck & Spine Committee
- North Carolina Coaches Association
- Northern Va. Football Coaches Assoc.
- Pac-12 Conference
- Pop Warner Little Scholars
- Prof. Football Athletic Trainers Society
- Sport Safety International
- Sports & Fitness Industry Assoc.
- United Youth Football

Youth Football Safety Surveillance Study, commissioned by USA Football

USA Football commissioned its Youth Football Player Safety Surveillance Study in February 2012 with Indianapolis-based Datalys Center for Sports Injury Research and Prevention. The independent scientific study monitored leagues in six states and is believed to be the first of its scope in youth football's 80-plus year history.

The study, which encompassed more than 4,000 players ages 5-14, documented player health and any sustained injuries during the course of the 2012 and 2013 seasons. USA Football anticipates commissioning ongoing research in future years for safer play and playing standards.

Study findings include:

- Nearly 90 percent of youth players did not sustain an injury that resulted in missing a game or practice.
- Of the 22.4 percent of players who reported an injury, 70 percent returned to play the same day.
- Of the 11.9 percent of players who missed a game or practice because of injury, 60 percent returned to play within seven days.
- Bruises were the most common injuries (34 percent), followed by ligament sprains (16 percent).
- 4.3 percent of players in the study sustained a concussion.
- Players were more likely to sustain an injury during games than in practices.
- No catastrophic head, neck or heat-related injuries were reported among the more than 4,000 players during the study's two-year span.

Datalys found that leagues and individual teams within leagues were the strongest predictors of injury after controlling for factors such as age, player size, plays per game and playing standards. Researchers conclude that coach education could address changeable behaviors within teams and positively influence player safety.

The dual purpose of this study was to examine the level of safety in youth football as well as any differences in safety across age-only and age-weight playing standards. Age-only leagues assign players to teams based strictly on age or grade level, though may assign a maximum limit on ball-carrier weight. Age-weight leagues assign players primarily based on their weight. The study found that there was no difference in the level of safety between either standard.

Also according to the study, injury risk was lowest among the youngest players – and gradually increased with age. Players ages 5-7 reported three injuries restricting participation. No youth player age 7 or younger sustained a concussion during the two-year study.

Thirteen youth football leagues of varying sizes and demographics in Arizona, Indiana, Massachusetts, Ohio, South Carolina and West Virginia comprised the study's sample. Individual leagues are undisclosed to preserve the anonymity of the participants.

The Datalys Center placed athletic trainers at the leagues' practice and game fields to manage and document player health. The Datalys Center employed the same intensive methodology to USA Football's Youth Football Safety Surveillance Study as it does for the NCAA Injury Surveillance Program and the National Injury Treatment, Injury and Outcomes Network (NATION™).

USA Football remains committed to research that advances player safety and welcomes all research on this topic across the landscapes of sport and science.

Non-Contact Football Development

USA Football is engaged in providing youth with non-tackling alternatives to developing their skills in the game.

USA Football's FUNdamentals program is designed to introduce children age 6-14 to football by teaching basic skills in a fun and energetic environment. More than 100 current and former NFL players hosted FUNdamentals camps in 2013. The program also is being licensed to multi-sport facilities for children.

FUNdamentals incorporates a series of drills to teach passing, catching and running skills in a non-contact setting. All skills and drills selected are based on USA Football's Player Progression Development Model, ensuring that children learn the game's fundamentals in an age-appropriate manner, based on their cognitive and physical maturity. Children also are introduced to the basics of USA Football's Heads Up Tackling techniques through fun, non-contact drills.

Our office also has administered the NFL FLAG powered by USA Football program since 2010. NFL FLAG is non-contact football that is open to girls and boys aged 5 to 17 and spans more than 1,000 youth sports leagues across the country.

Since USA Football began operating the program (2010), the number of young athletes has grown from 133,000 to 220,000 – an increase of 65.4 percent.

USA Football Background Check Program

USA Football offers all youth football programs a two-year background check for their adult volunteers that normally costs $25 and offers financial assistance to lower the price to $15. These checks are conducted by the National Center for Safety Initiatives (NCSI), a background screening industry leader.

The fully managed screening system is designed specifically for youth-serving organizations with optimal safety in mind. Subsidized by USA Football and made available to every youth football organization in the United States, the program is tailored to meet a youth football organization's needs. Services include a fully managed and administered program featuring online applicant self-registration and "Red Light/Green Light" determinations to easy-to-read background check reports. NCSI's Check-It-Twice™ searches include searches through two independent, screened and selected national database providers as well as all state sex offender registries and county records.

Since 2007, there have been more than 110,000 screens subsidized by USA Football (more than 25,000 in 2013).

Approximately 5 percent of these checks have drawn "red lights." The highest percentage of red lights are related to felonies, force or threat of force and controlled substances (generally in that order). More than 10 red lights were issued in 2013 for sex-related crimes, keeping these individuals away from youth football players.

USA Football Equipment Grant Program

USA Football annually distributes $1 million in equipment and uniform grants to youth and high school football programs across the United States based on need and merit. The program has awarded more than $6 million in football equipment since 2006.

Each selected youth league and high school receives a grant package valued at up to $1,000, offering a variety of football equipment and uniform options to choose from.

# # #

Mr. TERRY. Thank you. Now Briana Scurry, appreciate you being here, and you are recognized for 5 minutes.

STATEMENT OF BRIANA SCURRY

Ms. SCURRY. Thank you very much.

Yes, my name is Briana Scurry and I am 42 years old. I served as a starting goalkeeper for the United States Women's National Soccer Team from the years 1994 to 2008. During that time, I helped lead the team in winning two Olympic gold medals in 1996 Atlanta games and 2004 Athens, and played 173 international games over 15 years for the United States, which is a record among female goalkeepers.

In the summer of 1999, my 20 amazing teammates and I captured the hearts of America by beating China in a penalty kick shootout live in front of 90,000 screaming fans at the Rose Bowl in Pasadena, California. I was the one that made the single save during the penalty kicks before Brandi Chastain took off her shirt. Yes, now I will be many of you recall exactly where you were at that moment. It was the kind of event that transforms lives forever for the better. My passion and my mission was soccer. My ultimate reward was living my dreams and inspiring the dreams of countless others.

Today, I am here before you to share my new mission with you. My new mission is to provide a new face and voice to those who have had and may suffer the long and difficult recovery of a devastating traumatic brain injury and concussion.

My life story reads like a script from Oprah Winfrey's Where Are They Now. Like many of Oprah's guests, I too have been lost in deep, dark places with my face in the dirt, and have only recently begun to claw my way back to my life.

On April 25, 2010, my life changed forever. During that day, I played a women's professional game against the Philadelphia Independence in Philadelphia, and in that game, I suffered a traumatic brain injury that abruptly ended my beloved soccer career. That was nearly 4 years ago.

I struggled with intense piercing headaches that were so bad that, by the evening, it was all I could do not to cry myself to sleep. I had to take naps on a daily basis just because my sleep was so disrupted. I couldn't concentrate and I was very moody. I felt completely disconnected from everything and everyone. I was anxious and depressed every day, and I wondered if I would ever get better.

I recently moved to DC to have bilateral occipital nerve surgery at Georgetown to eliminate severe headaches that plagued me daily. Fortunately for me, the surgery appears to have worked, however, I am still being treated for symptoms such as lack of concentration, balance issues, memory loss, anxiety and depression. I have purposefully and intentionally had my concussion recovery story documented by media outlets, such as the USA Today, The Washington Post and Brainline.org, in order to bring attention and a ray of hope to those suffering from TBI like me.

In September, I was alarmed to learn that the number of reported cases of concussion in soccer was second highest in the United States, with only American football having more cases. Additionally, a recent article published in November stated that one

of two female youth soccer players will suffer a concussion while playing. I feel the numbers of reported cases are likely understated, and didn't designate those who suffered multiple concussions like I have. Statistics like these have solidified my urgency of purpose to shed light on the high frequency of concussions in youth, and the devastating emotional toll that prolonged symptoms often cause, yet are too frequently dismissed.

I sincerely hope that my presence here today will inspire increased awareness, understanding and assistance to help the thousands of young TBI sufferers across this country.

I thank you all for allowing me to give testimony. I am grateful and humbled to have been invited to do so. Thank you.

[The prepared statement of Ms. Scurry follows:]

Soccer Legend Briana Scurry Dedicates Herself to Concussion Awareness

Hello, my name is Briana Scurry, I am 42 years old. I served as the starting goalkeeper for the United States women's national soccer team from 1994 – 2008. During that time, I helped lead the team in winning two Olympic gold medals (1996 and 2004) and played in 173 international games over 15 years…which is a record amongst female soccer players.

In the summer of 1999, my 20 amazing teammates and I captured the hearts of America by beating China in a penalty kick shootout live in front of 90,000 screaming fans at the Rose Bowl in Pasadena, CA. I was the one that made the single save during the penalty kicks before Brandi Chastain took off her shirt. Yes, now, I'll bet many of you likely recall where you were at that moment. It was the kind of event that transforms lives forever for the better. My passion and my mission was soccer. My ultimate reward was living my dreams and inspiring the dreams of countless others.

Today, I stand here before you to share my *new* mission with you. My *new* mission is to provide a new face and voice to those who have and may suffer the long and difficult recovery of a devastating Traumatic Brain Injury (TBI)/concussion.

My life story reads like a script from Oprah's "*Where are they Now*?" Like many of Oprah's guests, I too have been lost in deep, dark places with my face in the dirt, and have only recently begun to claw my way back to "my life".

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I struggled with intense piercing headaches that were so bad that by the evening it was all I could do to not cry myself to sleep. I had to take naps on a daily basis because my sleep was so disrupted, I couldn't concentrate, and I was moody. I felt disconnected from everything and every one. I was anxious and depressed every day and I wondered if I'd ever get better.

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I sincerely hope that my presence here today will inspire increased awareness, understanding, and assistance to help the thousands of young TBI sufferers across this country. I thank you all for allowing me to give testimony. I am grateful and humbled to be invited to do so.

Briana Scurry
Former Professional Goalkeeper
U.S. Women's National Soccer Team

Mr. TERRY. Thank you very much. And that was powerful.

So this is our opportunity now, each of us have 5 minutes to ask you questions.

So, Ms. Scurry, let me ask you this one. I too was shocked to learn that soccer had the second most concussions, which is a really dominant youth sport. Are you seeing changes within soccer and, unlike there is an obvious top-to-bottom connection that we heard from the NHL and the NFL, is anything like that occurring in soccer?

Ms. SCURRY. Thank you for the question. I too was very surprised to read that statistic. I think it is so high in part because the explosion of players that are playing soccer now in the last 10 years.

I am not finding that soccer has completely grasped the alarm or the situation like USA Football, USA Hockey have. Part of the reason I am here today is to shed light that soccer too should be instrumenting different protocol like NHL and the NFL are, and hopefully the governing body for soccer, which is U.S. Soccer, will start to understand that our great sport is in danger of having too many head injuries, and that something does need to be done about it, and something needs to be instrumented.

Mr. TERRY. All right. And thank you, and I think your assessment of the game that you played, and winning that championship over China, we all, at least I, remember that one event.

Ms. SCURRY. Thank you.

Mr. TERRY. It was a great game.

Now, to Mr. Miller, the NFL has taken, I think, seriously, undertaken effort to get the so-called return to play guidelines adopted at all State levels. Can you tell us more about what the guidelines are and how they are developed?

Mr. MILLER. Sure, and thank you for the question.

The Zackery Lystedt Law, which is the model law that was passed out in Washington State, contained three primary elements, the first of which would be that parents and their kids would have to sign off on an education sheet a notification about the risks, signs and symptoms, related to concussion before they were allowed to participate. The second was that a child who appeared to have suffered a head injury must be removed from play immediately, in other words, the coaches were asked to act conservatively. And finally, that a licensed medical Provider who has a training in the management and evaluation of concussions has to return every child to play. And that part was done in large part to eliminate the danger that Zackery faced when he returned to play in the same game too soon.

And all these laws are very new, and so I know that there are academics who are studying them to see their success, but I just know, as one anecdote in Washington State, the one that had the first one, in the years after the Lystedt Law was passed, they didn't see a single brain injury, in other words, blood on the brain of any single football player in the State of Washington, and they had normally seen three or four significant brain injuries on an annual basis, and those were eliminated.

Now, that is anecdotal and more work needs to be done. And I commend those States who are going back and making their laws

more strict, because they need to be expanded to the youth level. Many of them are high school only. They need to be expanded to recreational spaces so it is not just school-based sports. And there is more that can be done, and there are those that are doing that, and we are happy to work with those.

Mr. TERRY. Thank you. Mr. Ogrean, have you seen a demonstrable reduction in concussion incidents at USA Hockey after implementing new techniques?

Mr. OGREAN. We do not have the same statistical data that I think USA Football has invested in, and, in fact, we are talking to DataList, the same company, to do that sort of thing.

Any concussions are too many concussions. What we have focused on is research, education and rules enforcement. The statement was made in someone's opening remarks regarding the culture of certain sports, and obviously, we know that a lot of sports at the youth level suffer from a misplaced, you know, macho attitude. A lot of coaches think they are coaching at the professional level, and they are not. And so changing that culture is very, very important. We have been very, very strict about return to play rules, and as Scott used the phrase earlier this morning that I appreciate very much, and we adopt the same thing, when in doubt, sit them out. And I think when you are talking about a grassroots sport, in our case, we have 350,000 youth players in 2,500 programs, and that equates to about 25,000 teams, one of our big challenges is quality control. You can't get everybody to act the same way or to think the same way, but we do know, I think because of our emphasis on preventing head injuries, and what to do with them, how to recognize them, how to treat them, how to respond to them, and making sure the return to play decision is a medical decision and not a coach's decision, that the number is dropping.

Mr. TERRY. Great. My time is over. And so the Ranking Member, Jan Schakowsky, you are recognized for your 5 minutes.

Ms. SCHAKOWSKY. Briana, my granddaughter, has played AYSO soccer since the first time that she could. Now she is on a traveling team in high school. She is 16, so I am very concerned about what you are saying, and even more concerned now after you are saying that soccer actually seems to lag behind other sports. And there have also been studies that have compared the rates of reported concussions for male and female athletes that tend to show that female athletes actually have a higher rate of reported concussions than male athletes in the same sports.

So what would you say that we need to do immediately? I mean I really do worry about her now and what could happen, so what would your advice be to female athletes, female soccer players, and to those who coach and treat them?

Ms. SCURRY. I too find that statistic very alarming. I think one of the things that needs to occur with soccer is officials and referees, coaches need to take their heads out of the sand a little bit and realize that this is something that is plaguing our sport as well. And the video that was played by Mr. Hallenbeck earlier was a fantastic example of where to start. You start with the coaches. You teach the coaches the proper way to teach the players how to head, and do certain drills to make sure that the coaches know how to teach it instead of just letting players run around out there, and

let the ball head them; instead, teach them how to head the ball, and also improve the strength of the neck muscles. For females, it seems to be part of the issue is they are not as strong as the male counterparts in heading. And so that needs to occur. And there just needs to be an understanding and an education of what you are looking for when a head injury does occur.

Ms. SCHAKOWSKY. Let me ask you a question. I don't know if soccer is the only sport where you quite deliberately use the head.

Ms. SCURRY. Right.

Ms. SCHAKOWSKY. Is that an inherent problem?

Ms. SCURRY. I don't necessarily think it is an inherent problem——

Ms. SCHAKOWSKY. Right.

Ms. SCURRY [continuing]. But, obviously, I think that scenario, when there is a ball in the air you are going to head, that there is something highly probable that could happen, but I think if you teach it properly, you are going to have those head injuries no matter what you do, just like they said, when you play the sport, you are going to have injuries that happen, but I think that certain things that happen during a heading situation isn't the only reason or only time when concussions occur.

Mine in particular happened when I was playing in the goal, going for a low ball from my left, the player came in from the right and hit me in the side of my head with her knee.

Ms. SCHAKOWSKY. Uh-huh.

Ms. SCURRY. And that has nothing to do with heading——

Ms. SCHAKOWSKY. No.

Ms. SCURRY [continuing]. At all, you know. Head to knee, head to foot, head to post isn't part of that.

Ms. SCHAKOWSKY. Well, I would love to get your advice as we move forward, and anything that I can do outside of this body, because I certainly——

Ms. SCURRY. Fantastic.

Ms. SCHAKOWSKY [continuing]. Worry about my granddaughter.

Mr. Miller, I wanted to ask you a question. Retired NFL players face some of the most serious health challenges of any sport, yet benefits for former players are not on a par with Major League Baseball or the National Basketball Association, despite the fact that the NFL has more than $9 billion in annual revenue.

So yes or no, does the NFL yet provide lifetime health insurance for former players who did not play under the current collective bargaining agreement?

Mr. MILLER. No. The players are able to continue their medical coverage when they leave the game, but they are not provided lifetime medical coverage.

In the most recent collective bargaining agreement with our Players Association, there were in excess of $600 million that went to the players who played pre-1993, and added pensions and benefits. All of our programs are collectively bargained with our Players Association, and so I think during each iteration of our collective bargaining agreements, you have seen changes and improvements made, excuse me, to the programs for retired players including this year, for example, this past CBA, for example. A neurocognitive program, screening program——

Ms. SCHAKOWSKY. Well, I understand——

Mr. MILLER [continuing]. That provides opportunities——

Ms. SCHAKOWSKY [continuing]. But professional baseball and professional basketball do provide lifetime health insurance for former players. And while I understand the NFL's ADA Plan, what could be the reason to not provide lifetime health insurance for former players?

Mr. MILLER. Well, like I mentioned, all of our programs, all of our benefits, and all of the policies are collectively bargained with the Players Association, and so the improvements that we have seen as far as care for retired players, whether they be the ADA Plan, as you mentioned, which accounts for any player who suffers from a diagnosis of dementia, neurocognitive benefits, which help players' joint and hip replacements, all of those sorts of things are improvements, and are made available to players should they suffer from those issues, in addition to a number of other practices and programs, including help lines and our Player Care Foundation, the Players Association has additional programs to help players who are in need at little or no cost, and those programs exist today.

Ms. SCHAKOWSKY. I yield back.

Mr. TERRY. Mr. Lance, you are recognized for 5 minutes.

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

Mr. Miller, the changes that you have made in recent years, the rules change, the increased penalties, suspensions for rule violations, reducing full contact practice days, can you share with the committee data that you have that this, I hope, has had a positive impact on concussion incidents that might encourage leaders at other levels of football?

Mr. MILLER. Absolutely. We are happy to share with the committee, you know, some greater information than I can offer in my oral testimony.

Mr. LANCE. Certainly.

Mr. MILLER. But the most interesting number from my perspective is when you count up the number of all the concussions that were diagnosed in games and practices, preseason in preseason practices, and postseason in postseason practices, you see a 13 percent decrease year over year. And——

Mr. LANCE. Thirteen percent each year? Year over——

Mr. MILLER. Thirteen percent between 2012 and '13.

Mr. LANCE. Very good.

Mr. MILLER. And the emphasis has been on eliminating the use of the head in the game, and specifically helmet-to-helmet hits, which are a significant cause of the injury. And in those circumstances that we have been able to identify where two helmets collide, we have seen a decrease in the number of concussions by that cause by 23 percent in the past year.

There is a lot more work to be done, and those numbers could change year over year. I don't think anybody should rely upon one-year data as some sort of conclusion, but I am happy to go into that further with the committee if you would like to see more of the information.

Mr. LANCE. Thank you. I think we would, and this is, of course, very helpful, and I hope that the improvements continue.

Mr. Hallenbeck, I believe your testimony indicated that 15 high schools in 10 districts participate in your pilot program last year, and that you are anticipating 500 to 1,000 will participate this fall. And, of course, I would imagine high school football is the football that most of us have experience, either through ourselves or through a child, and in my case, a son, and this is part of the American tradition.

What are your plans for getting more school football programs at the high school level to participate, and what does your outreach entail, and how do schools across the country learn about your program? I think the purpose of this hearing is multifaceted, and one of the purposes, I would hope, is to inform high schools across the country about your program, as the video indicated, occurs here, next-door in northern Virginia?

Mr. HALLENBECK. Thank you. So first of all, one of the common themes we are hearing, of course, is inconsistency, and football probably is the most fragmented of all used sports, and even at the high school level, there are significant challenges there. So what we are trying to strive for through this Heads Up Football program is consistent teaching, consistent teaching of technique, consistent teaching of terminology, and now getting out to the staunchly independent youth programs as well as now high school programs, the good news is they are actually being responsive. If it is their superintendents, if there are principals, their athletic directors, they are being asked, as it was mentioned in the video, "What are you doing about this?"

Mr. LANCE. And you are doing the asking, or the parents and PTAs are doing the asking?

Mr. HALLENBECK. It is a combination. We are talking to State associations, high school State associations, we are talking to coaches' associations, we are talking directly to coaches, we are working with athletic directors, we are working with parent groups, national PTA is involved, we are looking at every conceivable channel to communicate this program and the importance of changing behavior. And what I am sharing is there has been a very positive response.

That video by itself, and really the reason I decided to show it, has been incredibly influential. In addition, we now have the Big 10, the Pac-12, the Big 12, the ACC, we will eventually have the NCAA, we will have all college conferences involved, every one of their coaches will be involved, with PSAs and things of that nature that help influence high school coaches and high school programs to embrace the Heads Up Football program and help change behavior.

Mr. LANCE. Thank you. Let me say that if there is one message I wish to leave this morning in my 5 minutes of questioning is that I would hope that all of those involved at your level of football would examine what you are suggesting, because after all, that touches virtually all of the American people, and I commend the panel for its testimony.

Thank you, Mr. Chairman.

Mr. TERRY. Thank you, Mr. Lance. And I just editorialize, that is why we have NHL Youth Hockey, NFL Youth Football, is because it does seem that it trickles down. Whatever is said at the

top, then it gets pushed down to the youth, and so that was by design.

The gentleman from Utah is now recognized for your 5 minutes.

Mr. MATHESON. Well, thank you, Mr. Terry.

I first want to echo something that Mr. Waxman said in his opening statement. It may sound obvious but I think it is important that we acknowledge. This is a complicated issue. There are a lot of complexities to this, there is a lot we don't know about brain science, and I think we all could agree that the notion that this is an issue that merits significant investment and research is really something beyond even concussions in sports. We have traumatic brain injury in terms of our soldiers in the field. This is a really important issue that is complicated, and we ought to make sure we approach it in a thoughtful and comprehensive way, so, Mr. Chairman, thank you for scheduling this hearing today.

I was going to ask Mr. Miller, without taking too long, because this is an open-ended question, but could you kind of walk us through the steps, as information and research has brought more knowledge to the NFL, how has the league responded, and how have you positioned yourself on these issues to address the issues of concussions? And just if you could walk us through some of the history of how it has evolved within your organization.

Mr. MILLER. Yes, I am happy to do it, and thank you for the question.

I think the point that you made that the science has evolved——

Mr. MATHESON. Um-hum.

Mr. MILLER [continuing]. On neurological issues, certainly neurodegenerative disease, is one that the second panel, where there is a terrific expert lineup, can talk to, but we rely on the outside advice of very well known, well respected, probably internationally known neuroscientists to advise us as to what the state of the science is, and how best to go about changing out game to reflect that. And so that is how we ended up creating a unified concussion protocol and return to play protocol for our sideline. That is how we ended up with additional concussion experts on the sideline. This is based on the advice of outsiders who tell us this is the best way to handle your players, this is the best way to treat the game, and if you want a culture of safety, this is what you would do, and we follow their advice strictly and meet with them very frequently.

Mr. MATHESON. All right. And I notice your title is Senior Vice President of Health and Safety Policy. That has got to be a position that didn't exist 20 years ago, I bet?

Mr. MILLER. It did not exist 20 years ago——

Mr. MATHESON. Yes, so——

Mr. MILLER [continuing]. And I am proud to be in that role, and it is an exciting one.

Mr. MATHESON. I know this hearing is concussions, but since you are here, I have to ask you one other question that may be a little different topic.

Over the last few years, I have communicated with the NFL about my concerns about the issue of human growth hormone testing, and I know that is something that was raised in the last collective bargaining agreement effort, and there is an agreement to

agree later, but that hadn't always come together as much, and I know this is something that is important to the league.

Can you give us an update on what is going on on testing for human growth hormone?

Mr. MILLER. Sure. We appreciate the question.

Unfortunately, we don't have human growth hormone testing——

Mr. MATHESON. Right.

Mr. MILLER [continuing]. Yet. The league has been ready, able, willing to pursue it, as you mentioned, since it was agreed upon in the collective bargaining agreement. Unfortunately, our Players Association has thrown up obstacles—probably fair to say, from our perspective, excuses—for a period of time. And I think the testing goes to the integrity of the game, certainly. It also goes to the health and safety of the sport.

Mr. MATHESON. Yes.

Mr. MILLER. You don't know where this stuff is coming from. You don't know who is giving it to a player or players, and you don't know what they are putting in their bodies, and that is dangerous and it is also the wrong example to set. And so this is an important issue for us, and one that we are sorry has not gotten accomplished yet.

Mr. MATHESON. Well, that is an important issue to me, and that is why I wanted to raise it. I know that it is not this topic of this hearing, Mr. Chairman, but since he was here, I had to ask the question.

Ms. SCHAKOWSKY. No, but if the gentleman will yield just——

Mr. MATHESON. Yes, I will yield.

Ms. SCHAKOWSKY [continuing]. For one sentence. I think that is why we wanted to have the Players Association here too because, you know, that was a pretty strong criticism that you just made. It would be nice to have had the players as well to respond.

Mr. TERRY. Well, I will have to now interject. They were asked and they declined.

Ms. SCHAKOWSKY. Yesterday.

Mr. TERRY. No.

Mr. MATHESON. Well, anyway——

Mr. TERRY. That is not accurate.

Mr. MATHESON. Well——

Mr. TERRY. They were contacted before yesterday——

Mr. MATHESON. I want to reclaim my time——

Mr. TERRY [continuing]. And they still rejected.

Mr. MATHESON [continuing]. For one more question though, if I can. I have one more question for you. Where do you see things going? I know when you try to crystal ball, it is dangerous because you never know, but where do see things going in the next 5, 10, 20 years in terms of where technology is going to take us? Do you have some things about looking out on the horizon that we can be looking forward to?

Mr. MILLER. Yes, I will give you a specific example. As part of the scientific research that we entered into with GE, the world's leader in diagnostics, we set aside what we call innovation challenges, two $10 million pots of money. The first was to promote new ideas on how to better diagnose concussions. There aren't any objective tests now. They are all subjective analyses.

Mr. MATHESON. Right.

Mr. MILLER. And we had people from 27 different countries around the world offer ideas. We eventually rewarded 16 of them so far, biomarkers, blood tests, these sorts of things. And then in addition, we just completed another challenge that echoes around protective ideas, how to protect the brain better. We had more than 40,000 people from 110 countries around the world visit the Web site.

Mr. MATHESON. Wow.

Mr. MILLER. We had people from 19 different countries offer ideas on new protective equipment, and we are reviewing those now. And I think that because there is a lot more attention paid to this, and hopefully we are one of the actors that are catalyzing the science, that you are going to see changes in all of these places relatively soon.

Mr. MATHESON. OK. Appreciate that.

Mr. Chairman, my time is up so I will yield back.

Mr. TERRY. Thank you. The gentleman from Kentucky is now recognized for 5 minutes.

Mr. GUTHRIE. Thank you, Mr. Chairman. Thank you for being here. And, Ms. Scurry, thank you for being here. That, quite honestly, might have been the only soccer game I have ever watched from top to finish. It was——

Ms. SCURRY. Thanks a lot.

Mr. GUTHRIE [continuing]. About the time that my daughter was interested in soccer, so we were watching it——

Mr. TERRY. No pun intended with the top.

Mr. GUTHRIE. Top to—OK, no pun intended. That went over my head, I am sorry.

But what a great sporting event, and it is one of the great moments, and to be part of that is something special. And I think it was special because it was just so much America. It was youthful, you were underdogs, you were grit, determined, and you brought up Brandi Chastain, not I, and maybe a little exuberance, but it was a great moment, and I appreciate you doing that and sharing.

But I played high school football. That is my claim to athletic prowess, I guess, but we practiced in August. I remember one time, in the south, 90-something degrees, and we are all running water breaks, we run to the water break and some smart aleck kicks another guy's foot so he falls, knocks all the water over. So the coach says, well, if you guys don't know how to handle that, we are just not going to have water today. So that was over 30 years ago, and that would never happen anywhere today. There was actually in Louisville a young man who passed away on a football field, and the coach went to trial over it, and turned out he wasn't convicted but—so I think the awareness and, you know, stuff like what I described in my youth would never happen on a football field anywhere today, or at least I hope it wouldn't, but we still have these injuries. And I think, Ms. Scurry, you talked about your injury being—it wasn't heading, it wasn't changing tactics, it was just—in soccer you are wearing cleats and short pants and a shirt, and somebody hits you in the side of the head with their knee——

Ms. SCURRY. Right.

Mr. GUTHRIE [continuing]. And when you look at, I watch a lot of football, of course, then they will have targeting, you know, if you are in college football, you are ejected from the game for targeting. But a lot of the injuries you will see, if the quarterback gets knocked down and somebody runs and their knee hits them on the side of the head. And I don't know how you change those—and how do you deal with that kind of—I know you are trying to do the techniques and tackling and not heading the ball the right way, but just the incidental things that happen because you are playing a sport that you are going 100 miles an hour. Do you have any comments on that, Ms. Scurry?

Ms. SCURRY. Yes, well, thanks for the question.

That is very relevant, actually, because my hit, when I watched it actually last night again on video, it doesn't seem to be a hit that would have taken me out of the game. As it was, I got hit and then there were a few minutes later before I actually ended up coming out.

Mr. GUTHRIE. Wow.

Ms. SCURRY. There wasn't even a foul called, actually. So that is part of the problem, right? Sometimes a hit is a glancing blow, and it doesn't even really seem to be anything that is a big deal, but I think for me, my main focus is what is done after a hit occurs. And to keep children and young players off the pitch after a blow occurs to assess them, and then determine whether they are ready to go return to play or not. I think that is the key for me and why I am speaking out about this, because I have been around the country talking to different organizations, and I am finding that kids are getting concussions, five, six, seven, in a very short period of time, because they are returning to play too soon, and that is where I think a lot of the awareness and education can help.

Mr. GUTHRIE. Well, thank you.

And, Mr. Miller, with that, you should do everything you can to stop the head-to-head and so forth, but it seems, because they will play them on TV over and over—this is when somebody gets injured and they are out, like a knee of the lineman hits, somebody like Jon Runyan hits the side of somebody else's head—I mean, it is just incidental, but I guess you are right, you can't really prevent that from happening, but it is how you react to how that happens. Is that——

Mr. MILLER. Well, I think that is right. One of the recommendations made by the Fourth International Concussion Conference in Zurich was to look at the playing rules of the game. And in our case, we have done that, and I know other sports have done that as well, so you create the best possible situation.

Mr. GUTHRIE. Um-hum.

Mr. MILLER. In a contact sport, there will be injuries, and there will be, you know, hits to the head, and those problems will occur. And so where that happens, we want to make sure that we are treating them appropriately, and so that is where the focus shifts from prevention to appropriate treatment.

Mr. GUTHRIE. Well, thank you. And I am about out of time. I just want to say, Ms. Scurry, I was sitting on the edge of the couch, leaning and moving as they were shooting against you, and hope-

fully you felt my assistance and were able to help us both together win one for our team, right?

Ms. SCURRY. Absolutely.

Mr. GUTHRIE. Thank you very much. And I yield back, Mr. Chairman. Very good job and I am glad to meet you.

Ms. SCURRY. Thank you. You too.

Mr. TERRY. Thank you, Mr. Guthrie. Now the gentleman from Maryland is recognized for 5 minutes.

Mr. SARBANES. Thank you, Mr. Chairman, and thanks for the hearing, and thanks to our panel.

Mr. Hallenbeck, I had a quick question about whether the school districts that you have been working with that have been implementing this, has that affected the like liability policies that they maintain as a jurisdiction? In other words, is there any trend towards they may be getting pushed by the insurance industry, for example? So in other words, insurer would say, well, previously, I would have provided liability coverage to your school district based on these measures or assurances that the district mad with respect to how it is conducting its sports program, but now that there is this program that enhances the safety of students and young people, we want to see that you have implemented that in your district or else we are not going to provide the policy coverage, or we are going to charge you a higher premium. I mean you can look at it the other way. You get a discount off of your premium as a school district because you have implemented these kinds of measures. And I ask that because I think that increased awareness of some of the risks from these sports injuries may lead to pressure in terms of liability on school districts. And you will get some that may choose, based on the premium that gets charged, to push the program out because they don't want the liability that comes with it.

So I was just curious whether you are aware of that kind of effect from the program, or more generally aware of kind of how the liability concerns intersect with some of these safety efforts that are underway.

Mr. HALLENBECK. Thank you for the question.

At the high school level, we are literally on the front, you know, one-yard line marching down the field. And I will mention that we are having very positive conversations with the State of Maryland right now about participating in Heads Up Football across the entire State.

So we have a lot to do there. We have not seen anything from a liability concern, insurance concern. With Fairfax County, we worked very closely with all their schools and their school district about those issues, but they told us, and we checked ourselves, they felt they had the appropriate coverage. However, to your point, at the youth level, we are absolutely seeing the insurance industry at large, and really the largest provider of casualty and liability insurance, step forward and actually stated that if youth football leagues participate in the Heads Up Football program, they would receive a discounted program, and a more comprehensive coverage. So we are absolutely seeing a positive response by the insurance industry, which, of course, has its merits.

Mr. SARBANES. Thank you. I yield back.

Mr. TERRY. Mr. Ogrean, are there any insurance liability issues at USA Hockey?

Mr. OGREAN. Yes, Mr. Chairman, there are plenty of insurance liabilities, and I think unlike USA Football, for example, which is much more decentralized than are we, our participants are all insured by us as a national organization. So whether it is player accident insurance or whether it is catastrophic insurance, whether it is liability and even D and O for all of our leagues, all of that is part of what our members pay us a membership fee for.

Those claims, or those premiums, rather, are obviously based upon the number of claims. And so that is another business reason why it is in all of our best interests to try to come up with every technique, every practice, every policy that we possibly can to make our game safer. The number one reason, of course, is the safety of the human beings playing our sport, but there are good business reasons for all of us to want to do everything possible to make the game safer.

Mr. TERRY. Thank you.

Mr. Kinzinger, you are recognized for 5 minutes.

Mr. KINZINGER. Thank you, Mr. Chairman. Thank you for your leadership in holding this hearing, and to all of you, thank you for being here and bearing through a bunch of politicians. I appreciate it.

I appreciate the diverse panel that has gathered here, and the important insights you guys are able to provide on the prevalence of concussions in sports.

According to the CDC, 175,000 sports-related concussions impact youth athletes each year, and I think today's hearing has been very constructive in helping us to move forward on understanding that and alleviating it.

I have read much about the legislative action taken across the United States to pass concussion laws. In my home State of Illinois, similar legislation was passed in 2011 to require that education boards throughout the State work with the Illinois High School Association to adopt guidelines that raise awareness of concussion symptoms, and ensure students receive proper treatment before returning to the team. In addition, it is encouraging that professional sports leagues and teams are taking steps to address concussions not only in their own ranks, but also working with collages and youth leagues to bring attention to the issue.

Last year, the Chicago Bears—go Bears—kicked off a pilot program to provide certified athletic trainers at three high school stadiums during Chicago public school football games. Such high profile initiatives are important to combatting this issue, and I applaud the Chicago Bears for their leadership.

Again, I find these steps to be promising, but we are still confronted with staggering numbers of youth being impacted by sports-related concussions.

I would like to ask just a few questions, maybe not take all 5 minutes, maybe I will.

Let us talk about the equipment issue. I will ask each of you to respond.

Where are we at today in terms of what kind of equipment is being utilized to protect, versus maybe where we were a few years

ago, what kind of advances are yet to be made that you think we are on the cusp of making or that we should make, and then is this backed by medical science? Is that what is going into this idea?

So, Mr. Daly, I will start with you and I guess whatever you want to put into that subject would be great.

Mr. DALY. Well, thank you for the question.

It is a very important issue, obviously. The equipment issue is a very important issue, and something we are focused on jointly with our Players' Association. We have a protective equipment subcommittee that is part of our Joint Health and Safety Committee. So we look at all aspects of equipment and, particularly as it relates to head injuries, how we can improve equipment, and perhaps reduce the amount of head injuries we have. We have passed some rules over time with respect to some of the equipment we had seen develop over the years with hard padding, both in the shoulder area and the elbow area, and those potentially causing head injuries. So we have mandated padding of those areas areas of a player's equipment.

The helmet issue is a difficult issue, particularly in hockey, in terms of preventing concussion, and one of the things we are looking to work with our manufacturers on is research in terms of dealing with the rotational forces that can cause concussions, particularly in a sport like hockey, and whether a helmet can be designed to deal with those more effectively than it currently does.

Mr. KINZINGER. Thank you, sir.

Mr. Ogrean?

Mr. OGREAN. I think Mr. Daly answered the question pretty well for our sport. There is a great deal where we rely on the National Hockey League to be the leader, and a lot of what they do is of benefit to us in a trickle-down fashion, but as I mentioned in my opening testimony, we do have a Safety and Protective Equipment Committee of 40-year standing. They do look at a variety of issues. The facemask, for example, is something that is mandatory——

Mr. KINZINGER. OK.

Mr. OGREAN [continuing]. In youth hockey. It is not in the National Hockey League, though the shields for incoming players are now a standard.

Mr. KINZINGER. I am going to have to cut you off just because of time. Mr. Miller?

Ms. OGREAN. That will be fine.

Mr. MILLER. Sure. Football helmets were designed to prevent against skull fractures, and they do a fabulous job of that. They were not designed to protect against concussion, and so that sort of technology or design, I know that the helmet manufacturers are working on it. We are not there yet, and the league is doing what it can to inspire that, especially with our partnership with GE and Under Armour, to get new ideas around that. And the other thing we do is we do regular helmet testing in concert with our friends at the Players Association, so that we can inform our players of which helmets are working best.

Mr. KINZINGER. And, Mr. Hallenbeck, or, Ms. Scurry, you guys?

Mr. HALLENBECK. Yes, trickle-down effect, again, is important there, and the only thing I would add is we are working now closely with the Sport and Fitness Industry Association and their new

Football Council, so we are getting insight from them, and working together on how we can improve things.

Mr. KINZINGER. Thanks. And, Ms. Scurry?

Ms. SCURRY. As you know, we don't wear equipment in our——

Mr. KINZINGER. Right.

Ms. SCURRY [continuing]. Sport, but I do want to commend your State for their Illinois Youth Soccer Association is taking a real lead in concussion awareness. I actually just did an event in Chicago just last weekend——

Mr. KINZINGER. OK.

Ms. SCURRY [continuing]. For the association, and talking about concussions. And so your organization is doing a great job.

But in terms of equipment for my sport, we don't really have anything right now that is widely used, but hopefully in the future there could be something to help.

Mr. KINZINGER. Great. Thank you. Mr. Chairman, I will yield back.

Mr. TERRY. Gentleman from West Virginia is recognized for your 5 minutes.

Mr. MCKINLEY. Thank you, Mr. Chairman. I had to slip out for another meeting, so maybe some of these questions have been asked, but if you could help me out on this a little bit, one is: Is there anything that we can learn from the Defense Department with concussion injuries that we are hearing from when we talk to our troops that come back? I am just wondering if there is some way that we are all talking to each other? If you could help out on that.

Mr. Miller?

Mr. MILLER. Yes, I am happy to take that question. We are very proud of our relationship that we have fostered over the last couple of years with the U.S. Army and specific memorandum of understanding that went back a couple of years that covers a variety of different things.

We have gotten current and retired players together with returning active service members to talk about cultural issues. What is it about football or what is it about the military that makes it very difficult for somebody to remove themselves from play, or, certainly in the case of the military, from a battle. We found a great deal of reticence on behalf of both populations, sort of a shared reticence to remove themselves from their comrades or teammates. And it instills a question as to how you get somebody to talk about, to tell their teammate or to tell their colleague, hey, you don't look right, you should get off the field. And so we have learned a lot from that.

And let me just add briefly as well, we meet regularly with the Army to talk about the research that they are doing from a scientific perspective. We share our agenda, we share the ideas that we have, and they do with us as well, and it has proven to be a very cooperative and beneficial relationship thus far.

Mr. MCKINLEY. OK. Anyone else want to add to that, about our military?

The second question has to do with, States have Workers' Compensation programs to deal with the various disorders and injuries. Black lung in my State, it is treated in a way that people don't have to take legal action to get help through the Workers' Comp

program. Is that something that would be of benefit here in this program for injuries? A friend of mine has spent quite a few years in litigation with the NFL over this matter and just thinks it is such a cumbersome—and we also have an East Coast Hockey League team in our city, and we see so many injuries, and we hear from some of the players and coaches about that injury. Is there a time that we should have a Workers' Comp program for brain injuries? Should that be included in something?

Ms. SCURRY. If I——

Mr. MCKINLEY. If they are not required to file litigation to get help.

Ms. SCURRY. If I may. My case actually is a Workers' Comp case. I have gone through Workers' Comp to get the different doctors, to see different techniques that will help me, and that is part of my situation and part of the reason why it has taken so long because every time something is suggested or recommended, I have to go back to the insurance company to get permission to do it, and sometimes it takes a hearing to get everything moved forward. So maybe streamlining that somehow would be of great help.

And also in your previous question you talked about how can we help the military service people who have TBIs. For me, one of the best things I think would help is more of the psychological side and testing depression and anxiety and panic attacks to make sure that each person who comes back from the military who has a TBI gets help in that area, the emotional side of it, not just the physical. That would be very helpful, I think.

Mr. MCKINLEY. OK, thank you. Any other thoughts?

Mr. DALY. Well, Workers' Compensation laws are really different jurisdiction by jurisdiction, including for us in Canada where professional athletes are specifically excluded in most Workers' Compensation law, but it is certainly a mechanism that an increasing number of our former athletes are using in cases where they have debilitating injuries from their playing careers.

Mr. MCKINLEY. So what was your recommendation then? You are saying yes?

Mr. DALY. Well, again, I——

Mr. MCKINLEY [continuing]. We should be pursuing looking at that, or——

Mr. DALY [continuing]. I guess what I would say is, I think it is generally available to our former athletes currently, the Workers' Compensation protection.

Mr. MCKINLEY. I guess maybe that some of what we are hearing is different from that, that is why I want to raise it, but thank you for your comments about that.

I yield back the balance of my time.

Mr. TERRY. Gentleman yields back. Now Mr. Bilirakis from Florida, you are recognized for 5 minutes.

Mr. BILIRAKIS. Thank you, Mr. Chairman. I appreciate it very much. Thank you very much for holding this very important hearing, and I wanted to specifically thank Ms. Scurry for really speaking out. I really appreciate it. It makes so much of a difference, and thanks for your sacrifices. You are going to make a real difference in kids' lives.

I also want to get back to the protective gear, the helmets, what have you. And how does the youth, and we can ask all of you, how does the youth helmet, the protective gear, compare as far as safety, quality, to the NFL and NHL? Can you give me an opinion on that?

Mr. HALLENBECK. So I am certainly no expert on exactly how that compares, other than—I mean, my understanding is that there obviously is NOCSAE, the standard bearer, and they set the standards, and certainly all the helmets out there have to pass that standard, and I think the manufacturer, if they were sitting here, would say they go above and beyond that. How it compares to an NFL helmet, I think generally speaking, the youth helmet is lighter but the padding and so forth is appropriate. I don't want to suggest I am defending them. I don't know the exact details. I know it is sufficient based on standards and so forth. Many of the kids, though, I mean the players, youth players, I mean by 10 and 11 and 12 years old, they are transitioning into what might be considered, you know, certainly high school or adult helmets, so they are getting the best available.

And the other thing I would add is, certainly I am aware that the technology is improving in helmets and shoulder pads, and football equipment generally is definitely improving.

Mr. BILIRAKIS. Mr. Miller?

Mr. MILLER. Sure. We worked on a program with the Consumer Product Safety Commission, our Players Association, and some others recently that we would put money towards reconditioning older helmets for youth leagues. Certainly, the leagues that have, you know, budget constraints, as many do, probably don't get around to updating their helmets or what they call reconditioning them frequently enough. And so we put a fair amount of money into that program in coordination with the CPSE. I know Scott, USA Football runs an equipment grant program as well. So, addressing those needs. We know that a new helmet is better than an old helmet. We know a reconditioned helmet is better than one that hasn't been. Most important of all is that coaches learn how to fit the helmets. That is going to be the number one safety piece to the equation as it relates to kids. And so we are aware of these issues and we are trying to make a difference there as well.

Mr. BILIRAKIS. So, in your opinion, the youth helmet or the high school helmet is not as safe as the NFL, but you do have a program to help. Is that correct?

Mr. MILLER. Yes. I don't know about the——

Mr. BILIRAKIS. The quality might not be as good.

Mr. MILLER. I don't know about the comparative safety of the helmets.

Mr. BILIRAKIS. OK.

Mr. MILLER. I suppose that is probably a question that——

Mr. BILIRAKIS. Can I talk to you about this——

Mr. MILLER. Of course.

Mr. BILIRAKIS [continuing]. Particular program——

Mr. MILLER. No question.

Mr. BILIRAKIS [continuing]. To help out, because I know for parents where the kids play high school football, and the parent will purchase a better quality helmet for their child, and, you know, I

am concerned about the kids that don't have the, you know, the parents don't have the money, you know, to purchase that, and it is so very important. So I would appreciate working——

Mr. MILLER. Happy to.

Mr. BILIRAKIS [continuing]. With you on this.

Mr. MILLER. Every kid deserves the proper equipment.

Mr. BILIRAKIS. There is an existing grant program out there. I would like to hear about it. And then also, can I hear from the hockey as well——

Mr. OGREAN. Sure.

Mr. BILIRAKIS [continuing]. NHL?

Mr. OGREAN. At the youth level, I think the helmets are just as good as the National Hockey League, the only difference is size. They have to be certified by the Hockey Equipment Certification Council. There is a 3-year expiration date on every helmet. You can't use a helmet that is more than 3 years old.

Mr. BILIRAKIS. Very good. NHL wants to——

Mr. DALY. Yes. No, I would first echo Mr. Miller's comments that, you know, helmets in our sport as well are principally designed to prevent skull fractures. They're not principally designed to prevent concussions, and sometimes they can disperse force in a way that does prevent concussion but that is not their principle purpose. We also have regulations that we make available to our equipment managers and our players with respect to frequent replacing of helmets. So each player is essentially asked to replace his home helmet at least once a season, and his road team helmet at least two times a season, because we are worried about aging effects and degradation that accompanies travel requirements for our team. So frequent replacing of helmets is a priority for our league as well.

Mr. BILIRAKIS. Are their coaches educated? I mean do they know which size fits the child? Have they been briefed on those particular issues, because that is so very important? Youth sports, hockey and football.

Mr. OGREAN. They are. I agree with Mr. Miller that it is a big difference-maker, you know, in the helmet doing its job, but it is a pretty fundamental part of what a coach has to do to make sure the players on his team all have the proper equipment and are wearing it in the right way.

Mr. BILIRAKIS. Very good, yes. Sir, would you——

Mr. HALLENBECK. And I would just add——

Mr. BILIRAKIS [continuing]. Like to comment?

Mr. HALLENBECK. Yes. I would just add that it is a cornerstone of our Heads Up Football program——

Mr. BILIRAKIS. Very good.

Mr. HALLENBECK [continuing]. Equipment fitting, because, frankly, at the youth and high school level, we have found they don't know how to properly fit equipment, so it is a very important element within the program.

Mr. BILIRAKIS. Thank you very much for including that. As far as, you know, the youth, of course, the NFL Hockey stars, what have you, baseball, basketball, they are looked up to by our children, as you know. Do you all have programs where you can speak—that speak, you know, maybe go to the schools, football

players, what have you, professional football players, go to the schools and speak on these particular issues?

Mr. MILLER. Yes, our active players are, by and large, terrific at this topic. One of the elements that we included or offered up to USA Football as part of their Heads Up Football program was actually what we call an ambassador. So for leagues that were early adopters of the program, they would get visits and consultation with a retired NFL player.

We are trying to encourage our clubs, with great success by the way, they have really done a terrific job of embracing in their communities the youth leagues and others, and so that they are around the facility more, that they interact with coaches, trainers, and certainly players, which obviously bring—the star quality of it brings attention to it, which was part of the motivation in the first place. But we have found retired players thrilled to participate, and really active and helpful to the end that you suggest.

Mr. TERRY. All right, gentleman's time has expired.

Mr. BILIRAKIS. Thank you.

Mr. TERRY. So if any of you want to answer that question, you will have to do it by writing.

And brings me to the point that—you have a question, I am sorry. Recognize the gentlelady from Virgin Islands.

Mrs. CHRISTENSEN. Thank you. And thank you, Mr. Chairman. Sorry I am late, I was at another hearing downstairs.

Mr. Miller, I would like to ask you this question. Many tens of thousands of helmets are used every year that are more than 10 years old. I understand that the NFL participated in a program initiated by the Consumer Product Safety Commission by donating money that would go towards new helmets for youth football players in low income communities, and I really want to commend the NFL for this initiative.

Of course, it is going to cost a lot more money to get to the point where virtually all kids around the country who play football no longer wear old helmets that are likely degraded or obsolete. I am pleased to know of your donation to the CPSC initiative, because it strikes me as an acknowledgement that wearing an old helmet when playing football is not advisable. A statement from the NFL that would be very influential. We have also heard that reconditioning those under 10 years old is important to ensure the proper foam density, and that other degraded parts of the helmet are replaced.

So I wanted to ask you the following questions for a yes-or-no answer. I guess that is why I am sitting in Chairman Dingell's seat. We realize that many issues are subject to negotiations, but can the NFL commit to supporting prohibiting helmets on the field that are over 10 years old?

Mr. MILLER. In the youth space? You are talking specifically about youth football, prohibiting helmets that are——

Mrs. CHRISTENSEN. Yes.

Mr. MILLER [continuing]. Older than 10 years there? I, you know, I plead not enough familiarity with the issue. I know that there are a couple of States who have taken that step, and we would be happy to work with you to pursue it. The prime place that, as you

mentioned, that we work within in promoting new or refurbished——

Mrs. CHRISTENSEN. Well——

Mr. MILLER [continuing]. Helmets is with the CPSC or through USA Football, who has a grant program as well, but——

Mrs. CHRISTENSEN. So the first question is committing to supporting prohibiting helmets on the field that are over 10 years old. Could you commit to the supporting of policy position that helmets more than 10 years old present an unacceptable safety risk? That is the position that is taken by most of the helmet industry.

Mr. MILLER. If that is the position of the helmet industry, I would see no reason why we would have a concern with that. That sounds appropriate.

Mrs. CHRISTENSEN. Riddell and Adams strongly recommend that their helmets should be discarded after 10 years. Can the NFL commit to supporting a policy position recommending that helmets be discarded after 10 years?

Mr. MILLER. We would certainly support the helmet companies and how they advise people to use their products.

Mrs. CHRISTENSEN. We have also heard stories of players using beat-up lucky college helmets, or adjusting their helmets by perhaps removing some padding in the helmets for comfort. Will the NFL commit to support a policy position that all players should wear helmets that are reconditioned properly?

Mr. MILLER. Well, all of our players have choices in which helmets they use, as long as they pass the NOCSAE, the certification by these standards. And so that is something that is a point of discussion with our Players Association, and players have to use helmets that pass the standard. So I——

Mrs. CHRISTENSEN. And that means——

Mr. MILLER [continuing]. We are happy to support that.

Mrs. CHRISTENSEN [continuing]. That they were reconditioned properly, and they had the appropriate padding?

Mr. MILLER. Sure. The NFL players' helmets are reconditioned regularly, is my understanding, and our equipment managers work with the players to make sure that their helmets are in good working order.

Mrs. CHRISTENSEN. Thank you, Mr. Chairman.

Mr. TERRY. Thank you very much.

[Recess.]

Mr. TERRY. All right, why don't we have our witnesses take their respective places? OK, if we could have everybody take their seats. And as you are settling in, this is, pun intended, the more heady part of our hearing today where we are dealing with neuroscience and medical research and physics—well, physics when Dr. Gay arrives.

So panel two, I will introduce you from Mr. Cleland on down. Mr. Cleland is the Assistant Director, Division of Advertising Practices at the Federal Trade Commission. We have Ian Heaton, Student Ambassador for the National Council on Youth Sports Safety. And if I might editorialize, I think Jan did a great job of juxtaposing a face of TBI and concussions on each panel. And Ian, as a high school lacrosse player, is that face for the more scientific-based panel. So thank you, Ian, for taking your day away from school. I

know how tough it is to be pulled out of school and come testify before Congress. Just like a normal high school student. Then Dr. Robert Graham, Chair, Committee on Sports-Related Concussion in Youth at the Institute of Medicine. Dennis Molfese, Ph.D., Director, Center for Brain, Biology, and Behavior at the famed University of Nebraska. Thank you, Doctor. Then Dr. James Johnston, Assistant Professor, Department of Neurosurgery at the University of Alabama Birmingham. Star of screen, Dr. Tim Gay, Ph.D., Professor Atomic, Molecular and Optical Physics, University of Nebraska. Gerard Gioia, Ph.D., Division of Chief Neuropsychology, Children's Medical Hospital. And not quite up to the level of University of Nebraska, we have the Harvard Medical School. That is just humor. Professor of——

VOICE. Ha ha.

Mr. TERRY. Yes. Professor of Psychiatry and Radiology at Brigham and Women's Hospital, Harvard Medical School. Thank you for being here for a very impressive and esteemed panel of scientists and experts.

And, Mr. Cleland, we will start. You are now recognized for your 5 minutes.

STATEMENTS OF RICHARD CLELAND, ASSISTANT DIRECTOR, DIVISION OF ADVERTISING PRACTICES, BUREAU OF CONSUMER PROTECTION, FEDERAL TRADE COMMISSION; IAN HEATON, STUDENT AMBASSADOR, NATIONAL COUNCIL ON YOUTH SPORTS SAFETY; ROBERT GRAHAM, DIRECTOR, ALIGNING FORCES FOR QUALITY, NATIONAL PROGRAM OFFICE, GEORGE WASHINGTON UNIVERSITY; DENNIS L. MOLFESE, DIRECTOR, BIG 10-CIC-IVY LEAGUE TRAUMATIC BRAIN INJURY RESEARCH COLLABORATION; JAMES JOHNSTON, ASSISTANT PROFESSOR, DEPARTMENT OF NEUROSURGERY, UNIVERSITY OF ALABAMA-BIRMINGHAM; TIMOTHY J. GAY, PROFESSOR, DEPARTMENT OF PHYSICS AND ASTRONOMY, UNIVERSITY OF NEBRASKA-LINCOLN; GERARD A. GIOIA, CHIEF, DIVISION OF PEDIATRIC NEUROPSYCHOLOGY, CHILDREN'S NATIONAL HEALTH SYSTEM; AND MARTHA E. SHENTON, PROFESSOR OF PSYCHIATRY AND RADIOLOGY, BRIGHAM AND WOMEN'S HOSPITAL, HARVARD MEDICAL SCHOOL

STATEMENT OF RICHARD CLELAND

Mr. CLELAND. I am Richard Cleland. I am assistant director for the Division of Advertising Practices at the Federal Trade Commission's Bureau of Consumer Protection. I am pleased to have this opportunity to provide information about the actions we have taken over the past few years with respect to concussion protection claims; claims that implicate serious health concerns, especially those potentially affecting children and young adults are always a high priority at the Commission.

The Commission strives to protect consumers using a variety of means. First and foremost, the Agency enforces Section 5 of the Federal Trade Commission Act, which prohibits deceptive and unfair acts or practices. In interpreting Section 5, the Commission has determined that a representation, omission or practice is deceptive if it is likely to mislead a consumer acting reasonably under

the circumstances, and it is material that it is likely to affect the consumer's conduct or choice decision about a particular product at issue.

The Commission does not test products for safety and and efficacy; it does, however, require that an advertiser have a reasonable basis for objective claims conveyed in an ad. The Commission examines specific facts of the case to determine the type of evidence that will be sufficient to support a claim. However, when the claims involve health and safety, the advertiser generally must have competent and reliable scientific evidence substantiating that claim.

As awareness of the dangers of concussion has grown, sporting goods manufacturers have begun making concussion protection claims for an increasing array of products. These include football helmets and mouth guards, but also include other types of products.

In August 2012, the Commission announced a settlement with the makers of Brain Pad mouth guards. The Commission's complaint alleged that Brain Pad lacked a reasonable basis for its claims that the mouth guards reduced the risk of concussions, particularly those caused by lower jaw impacts, and falsely claimed that scientific evidence proved that the mouth guards did so. The final Order in that case prohibits Brain Pad from representing that any mouth guard or other equipment designed to protect the brain from injury will reduce the risk of concussions, unless the claim is true and substantiated by competent and reliable scientific evidence. In addition, the Commission sent out warning letters to nearly 20 other manufacturers of sports equipment, advising them of the Brain Pad settlement, and warning them that they might be making deceptive concussion claims about their products.

The FDC has monitored these Web sites and is working with them as necessary to modify their claims on their sites, and in some cases, ensure that the necessary disclosures are clear and prominent. Commission staff continues to survey the marketplace for concussion reduction claims, and alert advertisers who are making potentially problematic claims of our concerns, and of the need for appropriate substantiation for such claims.

Commission staff also investigated concussion reduction claims made by three major manufacturers of football helmets; Riddell Sports, Incorporated, Schutt Sport, Incorporated, and Xenith, LLC. In these matters, the staff determined to close the investigations without taking formal action, by which time all three companies had discontinued the potentially deceptive claims or had agreed to do so. Those cases are discussed in greater detail in the Commission's written testimony.

The Commission plans to continue monitoring the market for products making these claims, to ensure that advertisers do not mislead consumers about the product's capabilities or the science underlying them. At the same time, we are mindful of the need to tread carefully so as to avoid inadvertently chilling research, or impeding the development of new technologies and products that truly provide concussion protection.

The Commission appreciates the committee's interest in this very important area, as well as the opportunity to discuss our Agency'

effort to ensure that the information being provided to consumers, in particular, to the parents of youth athletes, is truthful and not misleading.

Thank you.

[The prepared statement of Mr. Cleland follows:]

PREPARED STATEMENT OF THE FEDERAL TRADE COMMISSION

IMPROVING SPORTS SAFETY: A MULTIFACETED APPROACH

Before the
House Energy and Commerce Committee
Subcommittee on Commerce, Manufacturing, and Trade

United States House of Representatives

Washington, D.C.

March 13, 2014

I. INTRODUCTION

Chairman Terry, Ranking Member Schakowsky, and Members of the Committee, I am Richard Cleland, Assistant Director for Advertising Practices in the Federal Trade Commission's (FTC or Commission) Bureau of Consumer Protection.[1] The Commission is pleased to have this opportunity to provide information about the actions we have taken over the past few years with respect to concussion protection claims made for football helmets and other sports equipment. Claims that implicate serious health concerns – especially those potentially affecting children and young adults – are always a high priority for the Commission. Given the dangers that concussions pose for young athletes engaged in sports, it is essential that advertising for products claiming to reduce the risk of this injury be truthful and substantiated.

II. FTC AUTHORITY

The Commission strives to protect consumers using a variety of means. First and foremost, the agency enforces Section 5 of the FTC Act, 15 U.S.C. § 45, which prohibits deceptive or unfair acts or practices. The Commission also maintains a robust consumer and business education program, and works closely with self-regulatory entities, such as the Council of Better Business Bureau's Advertising Self-Regulatory Council.

In interpreting Section 5, the Commission has determined that a representation, omission, or practice is deceptive if (1) it is likely to mislead consumers acting reasonably under the circumstances; and (2) it is material; that is, likely to affect consumers' conduct or decisions with respect to the product at issue.[2] When the Commission considers whether an advertisement

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[1] This written statement represents the views of the Federal Trade Commission. My oral presentation and responses to questions are my own and do not necessarily represent the views of the Commission or of any Commissioner.

[2] FTC Policy Statement on Deception, appended to *Cliffdale Assocs., Inc.*, 103 F.T.C. 110, 174 (1984). An act or practice is unfair if it causes or is likely to cause injury to consumers that

violates the FTC Act's prohibition against deception, the first step is to determine the messages that the ad is likely to convey to consumers. The Commission looks at the advertisement's "net impression," based on all of its elements; the advertiser is responsible for all reasonable messages, whether express or implied.

The next step is to determine whether those claims are false or misleading. The Commission does not test products for safety or efficacy. It does, however, require that the advertiser have a reasonable basis for all objective claims reasonably conveyed by the ad at the time it makes those claims. The Commission examines the specific facts of a case to determine the type of evidence that will be sufficient to support the claim.[3] However, when the claims at issue involve health and safety, the advertiser must have competent and reliable scientific evidence substantiating those claims. Moreover, if the advertiser represents that it has a particular level of substantiation for its claims – for example, the advertisement says that "clinical tests prove" the product works – it must have at least the level of substantiation specified in the advertisement.[4]

III. FTC LAW ENFORCEMENT EFFORTS

As awareness of the danger of concussions has grown and parents, in particular, have become more concerned about protecting their children from these brain injuries, sporting goods manufacturers have begun making concussion protection claims for an increasing array of

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is (1) substantial; (2) not outweighed by countervailing benefits to consumers or to competition; and (3) not reasonably avoidable by consumers themselves. 15 U.S.C. § 45(n) (1994). *See also* FTC Policy Statement on Unfairness, appended to *Int'l Harvester Co.*, 104 F.T.C. 949, 1070 (1984).

[3] *See Pfizer, Inc.*, 81 F.T.C. 23 (1972); *see also* FTC Policy Statement Regarding Advertising Substantiation, appended to *Thompson Medical Co.*, 104 F.T.C. 648, 839 (1984), *aff'd*, 791 F.2d 189 (D.C. Cir. 1986).

[4] *Removatron Int'l Corp.*, 111 F.T.C. 206 (1988), *aff'd*, 884 F.2d 1489 (1st Cir. 1989).

products. Accordingly, in recent years, the Commission has scrutinized concussion protection claims made for a variety of products, including football helmets, jaw protectors, and related products.

In August 2012, the Commission announced a settlement with the marketers of the Brain-Pad mouth guard.[5] The Commission's complaint alleged that Brain-Pad, Inc. and its president lacked a reasonable basis for their claims that Brain-Pad mouth guards reduced the risk of concussions, especially those caused by lower jaw impacts, and that they had falsely claimed that scientific studies proved that those mouth guards did so. The final Order in that case prohibits the Respondents from representing that any mouth guard or other equipment used in athletic activities to protect the brain will reduce the risk of concussions, unless that claim is true and substantiated by competent and reliable scientific evidence. The Order also prohibits them from misrepresenting the results of any tests or studies on such products, and from misrepresenting the health benefits of such products. As the Director of the FTC's Bureau of Consumer Protection noted when the settlement was announced, "Mouthguards can help to shield a person's teeth from being injured, and some can reduce impact to the lower jaw. But it's a big leap to say these devices can also reduce the risk of concussions. The scientific evidence to make that claim just isn't adequate."[6]

When the Brain-Pad Order became final in November 2012, Commission staff sent out warning letters to nearly 20 other manufacturers of sports equipment, advising them of the Brain-Pad settlement and warning them that they might be making deceptive concussion protection

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[5] *Brain-Pad, Inc.*, FTC Dkt. No. C-4375 (2012) (consent), *available at* http://www.ftc.gov/enforcement/cases-proceedings/122-3073/brain-pad-inc.

[6] Press Release, FTC, Settlement with FTC Prohibits Marketer Brain-Pad, Inc. from Claiming that Its Mouthguards Can Reduce Risk of Concussions (Aug. 16, 2012) *available at* http://www.ftc.gov/news-events/press-releases/2012/08/settlement-ftc-prohibits-marketer-brain-pad-inc-claiming-its.

claims for their products.[7] FTC staff then monitored the websites of these manufacturers, working with them as necessary to modify the claims on their sites and, in some cases, ensure that necessary disclosures were clear and prominent. Commission staff continues to survey the marketplace for concussion risk reduction claims, and to alert advertisers who are making potentially problematic claims of our concerns and of the need for appropriate substantiation for any such claims.

Commission staff also investigated concussion reduction claims made by three major manufacturers of football helmets: Riddell Sports Group, Inc., Schutt Sports, Inc., and Xenith, LLC. In these matters, the staff determined to close the investigations without taking formal action, by which time all three companies discontinued potentially deceptive claims from their advertising, or had agreed to do so.[8] The letters closing these matters may be instructive as to the types of concerns that these marketing claims may raise.

For example, Xenith, which the staff believed had represented that its helmets were significantly better than other helmets at reducing the risk of brain injury, agreed to remove from its advertising references to results of player surveys and statements about reductions in the occurrence of concussive episodes. Schutt, whose advertising had, among other things, showed

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[7] *See* http://www.ftc.gov/system/files/attachments/press-releases/ftc-approves-final-order-settling-charges-against-marketer-brain-pad-inc.allegedly-deceptive-claims-its-mouthguards-can-reduce-risk-concussions/121129brainpadwarningletter.pdf (template for warning letters).

[8] Copies of the staff's closing letters to the three companies are posted on the Commission's website. *See* Letter from Mary K. Engle to John E. Villafranco, Esq. (April 24, 2013), *available at* http://www.ftc.gov/sites/default/files/documents/closing_letters/riddell-sports-group-inc./130430riddellvillafrancoltr.pdf; Letter from Mary K. Engle to Michael E. Antalics, Esq. (April 24, 2013), *available at* http://www.ftc.gov/sites/default/files/documents/closing_letters/schutt-sports-inc./130430schuttatalicsltr.pdf; Letter from Mary K. Engle to Sheryl M. Bourbeau, Esq. (April 24, 2013), *available at* http://www.ftc.gov/sites/default/files/documents/closing_letters/xenith-llc/130430xenithbourbeaultr.pdf.

the company's helmets performing better than competing helmets in impact absorption tests, agreed: to remove from its website a statement that all of the company's helmets "are designed with the intent to reduce the risk of concussions"; to change how it presented the results of those impact absorption tests; and to accompany any representations that Schutt helmets absorb impact better than competing helmets with a clear and conspicuous disclosure that better impact absorption has not been shown to be correlated with reduced risk of concussion.[9]

The staff's investigation into Riddell's advertising focused on the company's claims that research proved that Riddell Revolution® varsity and youth football helmets reduced the risk of concussion by 31% compared to "traditional" helmets. In support of these claims, Riddell cited the results of a study, published in the journal *Neurosurgery*, that compared the concussion rates over three years between high school football teams that received new Revolution® helmets and teams that wore "traditional" helmets from their schools' existing stock.[10]

After consulting with experts in the field, FTC staff concluded that this study did not substantiate Riddell's advertising claim, given two "significant limitations" identified by the study's authors. First, the Revolution® helmets had not been randomly distributed across all of the participants in the study. The study's authors stated that without random assignment of helmets, it was impossible to determine whether there were other important variables that might have influenced concussion rates and recovery times. Second, the players in the control group who suffered concussions were younger than the concussed players in the Revolution group.

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[9] Although less impact on the brain generally is certainly better than more impact, a specific correlation between a reduction in impact as measured by standard drop tests and a corresponding reduction in concussion risk has not yet been identified.

[10] M. Collins, et al., "Examining Concussion Rates and Return to Play in High School Football Players Wearing Newer Helmet Technology: A Three Year Prospective Cohort Study," 58 Neurosurgery 275 (Feb. 2006).

The authors acknowledged that this statistically significant difference in age "may have played a role in the higher incidence of concussion seen in the traditional helmet."

The staff concluded that these limitations were so significant that they precluded a finding that the Revolution® helmet itself was responsible for the difference in the concussion rates experienced by the two groups of players and, therefore, that the study did not substantiate Riddell's claim that Revolution® varsity football helmets reduce concussions or the risk of concussion by 31% compared to other varsity football helmets. Furthermore, because the study only included high school players wearing Revolution® *varsity* helmets, the staff concluded that it did not substantiate Riddell's claim that Revolution® *youth* football helmets reduce concussions or the risk of concussion by 31% compared to other youth football helmets.

Nonetheless, the staff decided not to recommend enforcement action against Riddell based on a number of factors, including the fact that Riddell had discontinued use of the 31% claim,[11] and that subsequent testing conducted by researchers at Virginia Polytechnic Institute and State University (Virginia Tech) appeared to show that Revolution varsity helmets did perform better than Riddell's own "traditional" helmet, the VSR-4, in reducing concussion risks attributable to one of the major causes of these brain injuries (linear acceleration).[12]

IV. CONCLUSION

Sports are a strong and enduring thread in the fabric of our nation. The long-term health implications of concussions are a serious concern, however, as are misleading claims that

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[11] Although cessation of the conduct at issue does not bar the Commission from bringing an enforcement action under Section 5, it is a factor the agency can consider in deciding how to exercise its prosecutorial discretion.

[12] *See* Press Release, Virginia Tech College of Engineering, Virginia Tech Announces Football Helmet Ratings for Reducing Concussion Risk (May 10, 2011), *available at* http://www.eng.vt.edu/news/virginia-tech-announces-football-helmet-ratings-reducing-concussion-risk.

particular products reduce the risk of concussion. Accordingly, the Commission plans to continue monitoring the market for products making these claims, to ensure that advertisers do not mislead consumers about their products' capabilities or about the science underlying them. At the same time, we are mindful of the need to tread carefully, so as to avoid inadvertently chilling research or impeding the development of new technologies and products that truly do provide concussion protection.[13]

The Commission appreciates the Committee's interest in this very important area, as well as this opportunity to discuss our agency's efforts to ensure that the information being provided to consumers – in particular, to the parents of young athletes – is truthful and not misleading.

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[13] Indeed, the Riddell closing letter noted that the staff disagreed only with Riddell's use of the Neurosurgery results as the basis for its unqualified concussion protection claims for Revolution® helmets, but not with Riddell's attempt to develop a better helmet or with the underlying research conducted by the authors of the *Neurosurgery* article.

Mr. TERRY. Thank you. Now, Ian, you are now recognized for your 5 minutes.

STATEMENT OF IAN HEATON

Mr. HEATON. Chairman Terry, Ranking Member Schakowsky, and members of the subcommittee, thank you for the opportunity to share my story today.

My name is Ian Heaton, and I am here as a student ambassador for the National Council on Youth Sports Safety. I am also a senior at Bethesda Chevy Chase High School in Bethesda, Maryland.

I was a sophomore playing in a high school off-season lacrosse game when I sustained a serious head injury that we later discovered was my third concussion. Until then, I did not appreciate what a great life I was living. I got good grades in challenging classes, played high school lacrosse, was working on my second degree black belt in martial arts, had a job I loved teaching taekwondo, performed at my school's jazz ensemble and combo, and had an active social life. It was over in a split second.

My concussion left me with only 5 percent of normal cognitive activity, and I was almost immobilized.

I have spent 2 ½ years recovering, and, at times, have even wondered if I would ever get that life back. It has been a long, slow process.

At first, all I wanted to do is sleep. Noise, light, and even moving my eyes caused headaches and nausea. I was enrolled in the Children's Hospital SCORE Program that Dr. Gioia will describe later, where I received ongoing cognitive evaluation and treatment for symptoms.

After missing school for 2 weeks, I tried to go back but was unable to function. The frustration of trying to focus on lectures, moving through the pandemonium of the halls, and the constant sensory bombardment made a normal school day impossible. However, through my school, I eventually enrolled in a home teaching program, and with the help of my tutors and family, was able to complete my semester coursework at my own pace. I finally returned to school in December but was still far from recovered.

I have spent the 2 ½ years since my concussion slowly regaining organizational skills, the ability to learn and retain information, and, most important, my personality. During this time, my friends and family learned to recognize the signs that meant I needed to shut down from any kind of mental or physical activity for a day or two. These relapses were particularly tough and discouraging, and meant that I had to drop a class and miss a band trip to Chicago, among other things. The worst was when I had a crash and could not go to my first concert, the Red Hot Chili Peppers. The friend I gave my ticket to really owes me.

The spring after my injury, I was medically cleared to return to sports, but made the hard decision that I would not play lacrosse or other intensive sports again. I know that a lot of people recover and return to play, but the possibility of another concussion means I could lose everything again, just like that, and not come back the next time.

I now look at my recovery as something that has made me stronger, but I know that I am one of the very lucky ones who had

the resources and medical attention I needed, and a school system that is aware of concussion issues and provided an unusually high level of support.

It is not over yet. My recovery continues, but my outlook is positive and I am excited about the future as I prepare for college. I am thinking about becoming a high school math or science teacher.

I now have a hard question. What can be done to create a safer sports environment, and to ensure that when injuries do occur, the support for a full recovery is available? We can't just do away with youth sports. I have played baseball, travel soccer, and league and high school lacrosse, and being on those teams not only gave me a healthy outlook, it taught me important lessons.

Sports are one of the best parts of growing up and becoming a strong adult. They teach us that if we work hard, we will become skilled and proud of our accomplishments. They teach us how to be part of a team, to have pride and success, and learn the lessons of defeat. They teach us that sometimes we have to quit thinking of ourselves and think of the good of the team. For these and many other reasons, I hope that steps can be taken so that future young athletes have these opportunities.

There are two important things I think would make a big difference. The first is to change the cultures of hitting hard to take out a good opponent, rather than playing to win through skill, and brushing off injuries to get back into the game. While better equipment may decrease injuries, it is coaches, parents and players who have to back away from the need to win at all costs, or fear the losing status on the team when out for an injury, to be willing to recover fully before returning to play. It will take a while, but if youth and professional sports are to survive, these attitudes must be embraced.

Second, when injuries do occur, we must have a way for qualified personnel to quickly assess injuries on the field, have players get immediate attention, and then support recovery through schools and medical institutions. These are the things that were done for me, and are the reason I have been able to return to normal.

As a student ambassador for the NCYSS, the message I hope to give young athletes is this. You think you are invulnerable. You take risks and brush off injuries because you think you will recover quickly from anything happens. You won't. Don't be a hero, especially when it comes to your head. It is the only brain you will have, and your personality is who you are. It is not worth a couple of seasons of glory to lose the opportunity of a lifetime.

Thank you.

[The prepared statement of Mr. Heaton follows:]

Testimony of Ian Heaton

Student Ambassador for the National Council on Youth Sports Safety

Subcommittee on Commerce, Manufacturing, and Trade

"Improving Sports Safety: A Multi-faceted Approach"

March 13, 2014

Chairman Terry, Ranking Member Schakowsky, and Members of the Subcommittee: Thank you for the opportunity to share my story today. My name is Ian Heaton, and I am here as a Student Ambassador for the National Council on Youth Sports Safety. I am also a senior at Bethesda-Chevy Chase High School in Bethesda, Maryland. I was a sophomore playing in a high school off-season lacrosse game when I sustained a serious head injury that we later discovered was my third concussion. Until then, I did not appreciate what a great life I was living. I got good grades in challenging classes; played high school lacrosse; was working on my 2nd degree black belt in martial arts; had a job I loved teaching Tae Kwan Do; performed with my school's jazz ensemble and combo; and had an active social life. It was over in a split second. The concussion left me with only 5% of normal cognitive activity and I was almost immobilized. I have spent two-and-a-half- years recovering and at times, have wondered if I would ever get that life back. It has been a long, slow process.

At first, all I wanted to do was sleep. Noise, light, and even moving my eyes caused headaches and nausea. I was enrolled in the Children's Hospital Safe Concussion Outcome Recovery & Education program (SCORE), where I received ongoing cognitive evaluation and treatment for symptoms. After missing school for two weeks I tried to go back, but was unable to function. The frustration of trying to focus on lectures, moving through the pandemonium of the halls and the constant sensory bombardment made a normal school day impossible. However, through my school, I eventually enrolled in a home teaching program, and with the help of tutors and family was able to complete my

semester coursework at my own pace. I finally returned to school in December, but was still far from recovered.

I have spent the two-and-a-half-years since my concussion slowly regaining organizational skills, the ability to learn and retain information, and most important, my personality. During this time, my friends and family learned to recognize the signs that meant I needed to "shut down" from any kind of mental or physical activity for a day or two. These relapses were particularly tough and discouraging and meant that I had to drop a class and miss a band trip to Chicago, among other things. The worst was when I had a "crash" and could not go to my first concert, the "Red Hot Chili Peppers". The friend I gave my ticket to really owes me.

The spring after my injury, I was medically cleared to return to sports but made the hard decision that I would not play lacrosse, or other intensive sports, again. I know that a lot of people recover and return to play, but the possibility of another concussion means I could lose everything again, just like that, and might not come back the next time.

I now look at my recovery as something that has made me stronger, but I know that I am one of the very lucky ones who had the resources and medical attention I needed, and a school system that is aware of concussion issues and provided an unusually high level of support. It's not over yet—my recovery continues. But, my outlook is positive and I am excited about the future as I prepare for college; I am thinking about becoming a high school math or science teacher.

I now have a hard question: what can be done to create a safer sports environment and to ensure that when injuries do occur, the support for full recovery is available? We can't just do away with youth sports. I have played baseball, travel soccer, and league and high school lacrosse, and being on those teams not only gave me a healthy outlet, it taught me important lessons. Sports are one of the best

parts of growing up and becoming a strong adult. They teach us that if we work hard, we will become skilled and proud of our accomplishments. They teach us how to be part of a team, to have pride in success and learn the lessons of defeat. They teach us that we sometimes have to quit thinking of ourselves and think of the good of the team. For these and many other reasons, I hope that steps can be taken so that future young athletes have these opportunities.

There are two important things I think would make a big difference. The first is to change the cultures of hitting hard to take out a good opponent rather than playing to win through skill; and of brushing off injuries to get back into the game. While better equipment may decrease injuries, it is coaches, parents and players who have to back away from the need to win at all cost, or the fear of losing status on the team when out for an injury, and to be willing to recover fully before returning to play. It will take a while, but if youth AND professional sports are to survive, these attitudes must be embraced. Second, when injuries do occur, we must have a way for qualified personnel to quickly assess injuries on the field, have players get immediate attention, and then support recovery through our schools and medical institutions. These are the things that were done for me, and are the reason I have been able to return to normal.

As a Student Ambassador for the NCYSS, the message I hope to give young athletes is this: you think you are invulnerable. You take risks and brush off injuries because you think you will recover quickly from anything that happens. You won't. Don't be a hero, especially when it comes to your head. It's the only brain you'll have and your personality is who you are. It's not worth a couple of seasons of glory to lose the opportunity of your whole life.

Thank you for listening.

Attached supplemental material:
-Description of the Montgomery County Public Schools Home and Hospital Teaching program
-Information on the Children's Hospital Safe Concussion Outcome Recovery and Education (SCORE) program

Mr. TERRY. Very good. Dr. Graham, you are recognized for 5 minutes.

STATEMENT OF ROBERT GRAHAM

Mr. GRAHAM. Thank you very much, Chairman Terry, Ranking Member Schakowsky.

My name is Bob Graham. I served as the chair of the Institute of Medicine, Sports-Related Concussions in Youth Study. As you have my testimony before you, and I think copies of the study itself, I will just try to take these minutes just to give you a summary.

The Institute of Medicine is part of the National Academy of Sciences, which is chartered by the Congress to provide advice to the Congress and to the Executive on various scientific issues. We were specifically empaneled to look at the evidence about the causes and consequences of concussion in youth and military, the state of concussion diagnosis and management, the role of protective equipment, and sports regulation.

We had 17 members on our committed. We worked in 2013. Dr. Molfese, who will follow me, was a member of that committee, and we came with just six recommendations. The first was that the CDC needed to establish a better mechanism for national surveillance to comprehensively capture the incidents of concussions. You have heard a number of figures this morning about the concussions in one sport or another. We know what the incidence is where they are measured. We do not know what the incidence is in sports where they are not measured, or where they are not more closely watched. We need to have that baseline to really know the degree to which we have a problem, and as we take corrective measures, the success rate that we are having in making an impact on decreasing the incidence of concussions.

So, number one, we need better surveillance, we need better epidemeality. Number two, a couple of recommendations related to research. We need the NIH and the DOD to look more specifically at what metrics and markers are for concussions. How do you assess the severity of a concussion, how do you find diagnostically whether or not an individual has had a concussion. Right now, it is largely based upon observation, on self-report, but are there some physiologic markers that could be used to give us better documentation that a concussion has actually occurred, perhaps without the individual knowing it or without it being observed. Secondly, we need the NIH and DOD to look at more carefully and longitudinally at the short- and long-term consequences of concussions. We have heard testimony in this panel, the prior panel, individuals that have had one or more concussions, what are the long-term sequella of an individual or multiple concussions. That gives us some sense about not only, again, the epidemiology of the problem that we are dealing with, but what treatment and interventions may be, and what rehabilitation may be.

Fourth recommendation was to the NCAA and the National Federal of State and High School Associations to look at age-appropriate techniques, and roles and playing standards. And again, your first panel talked a little bit about that, mostly at the professional level, but can you change the manner in which the sport is

practices, and the rules of engagement in the sport that may decrease the risk of concussion. There was one example from the hockey area where they had changed the level where they allowed body checking, and felt that they saw a decrease in concussion. We think that that same sort of examination should take place at the college and the elementary and high school level to see whether or not that can have the same impact.

The fifth recommendation had to do with a better study of what the role may be for protective equipment. And again, your first panel talked a lot about that. The committee had a number of questions about that. Our committee found that there was very little evidence that helmets protect against concussions. And there is a lot of data in that, and I think some of the other panelists will be talking about that. You may come away with an equivalence degree in physics this morning. It is a complicated issue, but there are a number of suggestions. You know, we certainly did not recommend you don't use helmets. They do protect against bone injury and soft tissue injury, but the suggestion that a helmet itself may decrease the incidence of concussion, the evidence does not appear to be there to us, and we think that the NIH and DOD, again, have a role in looking more specifically at what we may be able to do related to the biomechanical determinates and protection against concussions.

And then our final recommendation had to do with the topic which has come up frequently, and that is changing the culture and the way concussions are viewed. This is a significant injury. Athletes need to be encouraged to report, to take themselves out of the game. Coaches and parents need to be encouraged to say, for your own protection, you need to be removed and give yourself a chance for recovery.

Thank you very much.

[The prepared statement of Mr. Graham follows:] [1]

[1] The report "Sports-Related Concussions in Youth: Improving the Science, Changing the Culture" and the accompanying slide presentation have been retained in committee records and also are available at *http://docs.house.gov/Committee/Calendar/ByEvent.aspx?EventID=101897.*

SPORTS-RELATED CONCUSSIONS IN YOUTH: IMPROVING THE SCIENCE, CHANGING THE CULTURE

Statement of

Robert Graham, M.D.
Director, Aligning Forces for Quality
National Program Office
The George Washington University
and
Chair, Committee on Sports-Related Concussions in Youth
Board on Children, Youth, and Families
Institute of Medicine-National Research Council
The National Academies

before the

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Summary of Dr. Robert Graham's Testimony on the Institute of Medicine-National Research Council report on Sports-Related Concussions in Youth

Much remains unknown about the extent of sports-related concussions in youth; how to diagnose, manage, and prevent concussions; and their short- and long-term health consequences. The Institute of Medicine-National Research Council report *Sports-Related Concussions in Youth: Improving the Science, Changing the Culture* offers the following recommends to help close these information gaps:

- The establishment of a national surveillance system to accurately determine the incidence of sports-related concussions, including in elementary school through college-age youth;
- Research to (1) establish metrics and markers of concussion diagnosis, prognosis, and recovery in youth and (2) inform the creation of age-specific, evidence-based guidelines for concussion management;
- Large-scale longitudinal studies to assess the short- and long-term consequences of concussions, as well as subconcussive impacts (i.e., impacts that do not result in symptoms of concussion), across the life span;
- Scientific evaluation of the effectiveness of age-appropriate techniques, rules, and playing and practice standards in reducing sports-related concussions;
- Research on age- and sex-related biomechanical determinants of risk for concussion in youth;
- Development, implementation, and evaluation of large-scale efforts to increase knowledge about concussions and change the culture surrounding concussions among elementary school through college-aged youth and their parents, coaches, sports officials, educators, trainers, and health care professionals.

Good morning, Mr. Chairman, ranking member Schakowsky, and members of the Subcommittee. My name is Robert Graham. I am Director of the Aligning Forces for Quality program at The George Washington University and served as chair of the Committee on Sports-Related Concussions in Youth (henceforth referred to as "the Committee") of the Institute of Medicine (IOM) and National Research Council (NRC). The NRC is the operating arm of the National Academy of Sciences, National Academy of Engineering, and the IOM of the National Academies, chartered by Congress in 1863 to advise the government on matters of science and technology. To carry out the study on sports-related concussions in youth, the IOM-NRC received support from the Centers for Disease Control and Prevention (CDC), the CDC Foundation with support from the National Football League, the Department of Defense (DoD), the Department of Education, the Health Resources and Services Administration, the National Athletic Trainers' Association Research and Education Foundation, and the National Institutes of Health (NIH).

The Committee was asked to review the available evidence on concussions in youth, including in military personnel and their dependents, related to the causes and consequences of concussions; the current state of the art on concussion diagnosis and management; and the effectiveness of protective equipment and sports regulations for the prevention of concussions. Based on its review of the evidence, the Committee was asked to recommend actions that can be taken by research funding agencies, schools, military organizations, and other stakeholders to improve what is known about concussions in youth, improve their diagnosis and management, and to reduce their occurrence. I am here today to present to you the findings, conclusions, and

recommendations from the Committee's report, *Sports Related Concussions in Youth: Improving the Science, Changing the Culture,* released on October 30, 2013.

Surveillance

Surveillance data can provide valuable information on the incidence and causes of sports-related concussions. Ongoing systems, such as the National Electronic Injury Surveillance System (NEISS), the High School RIO™ (Reporting Information Online), and the National Collegiate Athletic Association (NCAA) Injury Surveillance System, are important sources of sports-related injury data, including data on concussions, in youth athletes. However, because these systems were designed to collect data on specific populations they are not able to provide a comprehensive picture of the incidence of concussions across all youth and sports. The NEISS captures data for youth seen in emergency departments, but many concussions are evaluated by athletic trainers, physicians, and other qualified personnel in other venues. Concussion incidence data for high school and college students are captured by the High School RIO™ and NCAA Injury Surveillance System, respectively, but these systems were not designed to capture data for the many youth who participate in club sports and competitive and recreational sports outside of an academic setting. In addition, there has been little research on the frequency of concussions in athletes younger than high school age.

Part of the Committee's charge was to examine sports-related concussions among military dependents as well as concussions in military personnel ages 18 to 21 resulting from sports and physical training at military service academies and during recruit training. There is very little data pertaining to this type of injury among the populations specified. With respect to the dependents of military personnel, the Committee found no

evidence that the risks for concussion are different for these youth than for youth in general. With respect to military training, although the committee read anecdotal reports that many military personnel sustain concussions during hand-to-hand (combatives) courses during basic training, data on the occurrence of concussions during such training have not been published in the peer-reviewed literature.

To help close these gaps in sports-related concussion surveillance data, the Committee recommends that the CDC, taking into account existing surveillance systems and relevant federal data collection efforts, establish and oversee a national surveillance system to accurately determine the incidence of sports-related concussions, including in elementary school through college-age youth. Data collected should include demographic information, preexisting conditions (e.g., learning disabilities), concussion history, the use of protective equipment and impact monitoring devices, the qualifications of personnel making the concussion diagnosis, and information on the cause, nature, and extent of injury (Recommendation 1 of the IOM-NRC Report).

The High School RIO™ and NCAA Injury Surveillance System have demonstrated some patterns in rates of sports-related concussions among high school and college athletes. In particular, among these athletes concussion rates appear to be higher in competition than in practice (except in cheerleading) and higher among females than males in comparable sports (e.g., basketball, ice hockey, soccer, softball/baseball). Among male athletes at the high school and college levels, football, ice hockey, lacrosse, wrestling, and soccer are associated with higher rates of concussions. Among female athletes, the high school and college sports associated with higher rates of concussions are soccer, lacrosse, basketball, and ice hockey.

Diagnosis, Management, and Health Effects

Given the absence of a diagnostic test or biomarker for concussion, the current cornerstone for concussion diagnosis is confirming the presence of a constellation of concussion signs and self-reported physical-, cognitive-, emotional-, and sleep-related symptoms. Reliance on an athlete's self-report of symptoms to diagnose concussion is complicated by the subjective nature of the assessment and the possibility of an athlete underreporting his or her symptoms. In a 2012 survey of high school football players, for example, a majority indicated that it was "okay" to play with a concussion and said that they would "play through an injury to win a game," despite being knowledgeable about the symptoms and dangers of concussions (Anderson et al., 2013). Combining symptom assessment with other evaluation tools, such as balance testing and neurocognitive assessment, may improve the accuracy of a concussion diagnosis. This is the current preferred method of diagnosing a concussion but the Committee found that existing research is insufficient to determine the best combination of measures.

Neuropsychological tests are designed to detect subtle changes in cognitive function following head injury and are one of several tools used by health care providers to document and track recovery and to help determine when a concussed athlete has recovered enough to return to activity. Yet, the Committee found that studies of the effectiveness of neuropsychological tests to predict diagnosis and track recovery in individuals who have sustained sports-related concussions have had mixed results, and an individual's test performance can be influenced by many factors, including effort and the presence of concussion symptoms (e.g., fatigue resulting from sleep disturbance). The Committee found no data on the effectiveness of neuropsychological testing for

monitoring recovery in individuals whose symptoms persist beyond the typical recovery period of 2 to 3 weeks (i.e., individuals with post-concussion syndrome).

Expert consensus opinion holds that athletes who have sustained a concussion should refrain from physical activity until symptoms have resolved, as activity may worsen symptoms, potentially prolong recovery, and increase risk of a repeat injury (Giza et al., 2013; Halstead et al., 2010; Harmon et al., 2013; McCrory et al., 2013). Mental rest (e.g., eliminating or decreasing activities that require concentration, such as schoolwork) may also be recommended for the initial period following concussion. Although it is widely accepted that concussion symptoms are aggravated by both physical and mental exertion, the Committee found that there is currently little empirical evidence for the optimal degree and duration of rest needed to promote recovery or the best timing and approach for returning to full physical activity.

To improve the science on concussion diagnosis and management, the Committee recommends that the NIH and DoD support research to (1) establish metrics and markers of concussion diagnosis, prognosis, and recovery in youth and (2) inform the creation of age-specific, evidence-based guidelines for concussion management (Recommendation 2 of the IOM-NRC Report).

The Committee found that most studies of the shorter-term effects of multiple concussions show that these injuries result in a decrease in cognitive function, with the most commonly reported neuropsychological impairments being in the areas of memory and processing speed. Studies of the effects of subconcussive impacts (i.e., those that do not result in symptoms of concussion) have had mixed results, with some showing an association between such impacts and functional impairment, and others not. Preliminary advanced imaging research indicates structural changes in the brain

following subconcussive head impacts, but further research is needed to determine whether or not such changes are permanent. The role that multiple concussions and subconcussive impacts play in long-term health also is not fully understood. For example, the Committee found that more data are needed to determine whether multiple concussive or subconcussive impacts sustained in youth increases the risk for later neurodegenerative diseases, such as chronic traumatic encephalopathy–commonly known as CTE—Alzheimer's disease, or other neurodegenerative diseases. To this end, the Committee recommends that NIH and DoD conduct large-scale longitudinal studies to assess the short- and long-term consequences of concussions, as well as subconcussive impacts, across the life span. Such research should aim to identify predictors and modifiers of negative outcomes, such as sex and comorbidities (e.g., history of substance abuse), among others (Recommendation 3 of the IOM-NRC Report).

Safety Standards and Protective Equipment

Rules of play are the foundation of safe conduct in sports because they set expectations for behavior and define infractions. Although additional research is needed, some research involving youth athletes (e.g., youth ice hockey players) has shown that the enforcement of rules and fair play policies contributes to reductions in the incidence of sports-related injuries, including concussions. In response to concerns about the potential long-term consequences of repetitive head impacts, some youth sports organizations (such as Pop Warner) have called for a "hit count" limiting the amount of head contacts a player can be exposed to over a given period of time. While the concept of limiting the number of head impacts is fundamentally sound, there is currently a lack of evidence to support the use of a specific threshold for the number or magnitude of

impacts a youth athlete is exposed to per week or per season. The committee recommends that the NCAA, in conjunction with the National Federation of State High School Associations (NFHS), national governing bodies for youth sports, and youth sport organizations undertake a scientific evaluation of the effectiveness of age-appropriate techniques, rules, and playing and practice standards in reducing sports-related concussions. DoD should conduct equivalent research for sports and physical training—including combatives—at military service academies and for military personnel (Recommendation 4 of the IOM-NRC Report).

Designing more effective protective equipment may offer one route to protecting youth athletes from concussions. Protective devices reduce the risk for sports-related injuries, such as skull fractures (helmets) and injuries to the eyes, face, mouth, and teeth, and their use should be promoted for this reason. However, the Committee found little evidence that current helmet designs reduce risk of concussions in youth and no evidence that other protective devices (e.g., mouthguards, facial protection worn in ice hockey) reduce concussion risk. In sports, the vast majority of impacts to the head result in a combination of linear (i.e., along a straight line) and rotational acceleration. It is this combination that can lead to a concussion. Current testing standards and rating systems for protective equipment do not incorporate measures of rotational head acceleration or velocity and therefore do not comprehensively evaluate a particular device's ability to mitigate concussion risk. Furthermore, research on the ability of helmets to reduce concussion risk has been conducted predominately in college-age and older individuals and has not taken into account how risk of injury may be modified by sex or prior head injury. The Committee recommends that NIH and DoD fund research on age- and sex-related biomechanical determinants of risk for concussion in youth, including how injury

thresholds are modified by the number previous (concussive and subconcussive) injuries and the time interval between injuries (Recommendation 5 of the IOM-NRC Report).

Culture Change

The acknowledgment of the seriousness of sports-related concussions has initiated a culture change, as evidenced by campaigns to educate athletes, coaches, physicians, and parents of young athletes about concussion recognition and management, rule changes designed to reduce the risk of head injury, and the enactment of legislation designed to protect young athletes suspected of having a concussion. Yet, as the Committee did its research and listened to public testimony, we found indications that the culture shift is not complete. In many settings, the seriousness of the threat to the health of an athlete, both acute and long-term, from suffering a concussion is not fully appreciated or acted upon by athletes, their teammates, and, in some cases, coaches and parents. Similarly, military recruits are immersed in a culture that includes devotion to duty and service before self, and the critical nature of concussions may often go unheeded. If the youth sports community can adopt the belief that concussions are serious injuries and emphasize care for players with concussions until they are fully recovered, then the culture in which these athletes perform and compete will become much safer. The Committee recommends that the NCAA and the NFHS, in conjunction with various other public and private groups, develop, implement, and evaluate the effectiveness of large-scale efforts to increase knowledge about concussions and change the culture—social norms, attitudes, and behaviors—surrounding concussions among elementary school through college-aged youth and their parents, coaches, sports officials, educators, trainers, and health care professionals (Recommendation 6 of the IOM-NRC Report).

Thank you for the invitation to testify. I am happy to answer any questions the Subcommittee might have.

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Mr. TERRY. Thank you. And then, Dr. Molfese, you are recognized for your 5 minutes.

STATEMENT OF DENNIS L. MOLFESE

Mr. MOLFESE. Thank you, Chairman Terry, Ranking Member Schakowsky, and members of the subcommittee for this opportunity.

If we could have the slides. Go to the next slide. Yes. So I think the earlier group talked about a number of—if you can go ahead and put that on Power Point—a number of sports where the rate of concussion is particularly high. There are, of course, differences in rates for men and women, and Dr. Gay will talk about some of that in terms of weaknesses of women's necks relative to men's necks and how that puts them perhaps at more risk for concussion.

Next slide. Concussion accounts for, in the United States, roughly about 75 percent of traumatic brain injuries. It is a brain injury. There is damage to the brain. There is the discussion about whether it is permanent or temporary. In the military, the rate is 77 percent. So it turns out that youth sports are a good model for also looking at concussion in terms of the military. And, in fact, most of the military concussions occur in situations most like they do with the rest of America. Some certainly occur in theater, but majority occur outside of theater in accidents like we all are sort of prone to experience.

Next slide. If we look at brain injuries overall, there are estimates—these are all estimates, of course, and they vary across the literature, but we are looking at somewhere probably in the neighborhood of about 4 million traumatic brain injuries per year in the United States. Severing part of that is that our birth rate in the United States is also roughly about 4 million. This does not count other ways that children are exposed to head injuries. Perhaps a disciplining, irate parent who slaps a child, that creates rotational movement that can, in fact, produce a concussion. Those, one would suspect, are largely unreported.

Recovery generally is fairly quick, usually within anywhere from a few hours to a few days. Some will persist to 2 weeks, even perhaps out to 6 weeks, but roughly about 20 percent seem to persist beyond that time.

Next slide, please. This is a slide just on some data that we have under review, but it will give you sort of a sense. These are data recorded using brain electrical activity. So basically, you have a net of 256 electrodes that fits on the head in about 10 seconds or so. And we present a series, in this case, a series of numbers. One number at a time. All the college athletes had to do was simply say whether the number they currently see matches or does not match a number that occurred two positions earlier. And on the left side, those orbits, those circles you see, the colored circles on the left for match and non-match, those are imagines of the brain electrical activity on the scalp recorded from those electrodes, between 200 and 400 milliseconds. So 2 tenths to 4 tenths of a second after the number appears. So the schematic on the right shows you the head position. So it is a very rapid brain response. For those athletes who have no history of concussion, we see a very clear difference in the electrical activity for the match versus the mismatch. A lot of yel-

low and green in the top left orb, and in the bottom we see red and various shades of blue from the front of the head to the back of the head. On the right though, these are individuals who have a concussion history of 1 to 2 years earlier, not current, and yet at 200 to 400 milliseconds, their brains cannot discriminate whether those two numbers are the same or different. They ultimately get these tasks correct, but it takes them roughly 200 milliseconds longer. That is 20 synapses. So the processing speed is slow. And after 2 years, one might suspect that is a permanent change.

The next slide, I think that—yes, so in terms of critical scientific gaps, some of these we do what Dr. Graham talked about, you know, how does concussion affect the brain in the short and long term. We really don't have much information about that. What is the dose requirement, Dr. Graham talked about that, to produce a concussion, post-concussion syndrome, CTE, how can we reliably, objectively detect when the brain is injured, and when, importantly, it is fully recovered. We have no ways to do that. Lots of individual differences from one person to the next. We think there are genetic factors involved, but there could also be a concussion history that a person may not really think they have. How many of us have bumped our head getting in and out of a car. So we have a quick rotational movement, and that could produce perhaps a concussion. And then how does the brain recover from TBI. And then, finally, how we improve and accelerate recovery. We really have no scientific basis for any of our interventions.

Thank you.

[The prepared statement of Mr. Molfese follows:]

Dennis L. Molfese, Ph.D.
Director: Big10-CIC-Ivy League Traumatic Brain Injury research Collaboration

Concussion

The Problem: There are no definitive "Gold Standard" measures for the diagnosis, prognosis, or prediction of recovery from Traumatic Brain Injuries (TBI). Instead, diagnoses are symptom-based, relying heavily on professionals of varied backgrounds and training to identify, classify, determine and track the course of treatment. Today, treatment programs for TBI are based solely on expert recommended "best practices" instead of evidence based empirical studies or randomized clinical trials of intervention effectiveness (IOM, 2013). Unfortunately, the lack of Gold Standard diagnostic systems and the absence of research-based best practice interventions to maximize recovery have profound negative consequences for 100 million plus young men and women participating in sports programs. According to a Center for Disease Control Report for the general U.S. population, of the cases of TBI reported during from 2000 through the last quarter of 2012, 75% were characterized as mild TBI/concussion, 19% as moderate TBI, and 4% as severe TBI. Interestingly, the percentage of TBI cases in the military classified as mild TBI (77%) is nearly the same as that reported for the military. Tragically, the absence of effective diagnosis and intervention systems for mild TBI means these individuals in the general population and the military face prolonged recovery periods with uncertain prognoses for recovery to a level that would enable them to resume a normal, productive lifestyle.

The major barrier to effective diagnosis in cases of suspected mild TBI is the heavy reliance on injured individuals to accurately report symptoms. In the absence of objective measures, this long-used approach is fatally flawed. As Betthauser et al. (2012) noted, new work must move forward to identify reliable, accurate, and clinically-useful measures to assess TBI (Hudak et al, 2011).

Solutions:

1. Assessment and Treatment Changes: To advance our ability to objectively diagnose, monitor and remediate concussion, there is an urgent need for a evidenced based battery of cutting-edge neural imaging and cognitive/behavioral tests. These integrative procedures must be able to predict and track the effectiveness of research-based interventions, providing objective and frequently updated information to the patient and the practitioner throughout the recovery period. Given the high incidence of concussion as a milder form of TBI (75%-77% of all cases of TBI in civilian and military populations), the need for advanced research is most pressing.

2. Rule Changes: The focus should be on reducing the speed of contact as well as the target area impacted. Dr. Tim Gay notes in his book, *The Physics of Football* (2005, 1st Ed.), that the speed of the players colliding as well as their physical size combine to multiply the g-forces that contribute to injuries in general, and concussions in particular. Rotational forces that impact the head at an angle are thought to be a major contributor to concussion incidence. As the NFL as already done, changing the line up for kickoffs and returns or perhaps eliminating the kickoff and kickoff returns altogether could reduce both the frequency as well as the severity of concussions and other injuries. Thirty percent of injuries occur during kickoffs, with at least 20% involving concussions. Rules that further restrict blows to the head are another possibility.

3. Equipment Changes: More work must move forward to evaluate the protective aspects of sporting equipment. The 5-star rating for football helmets primarily measures linear forces that do play a role in head injuries. However the system is much less sensitive to detecting rotational forces, a prime contributor to concussion. There is also a trend among athletes to wear less equipment. While this may provide the athlete with a sense of agility, it also opens them up to more possibilities of injury.

Playing Surfaces: Another area of review should involve the playing surface of the field or court. A surface with some flexibility could potentially reduce both physical injuries as well as concussions.

Fraud: There are also claims made by a number of manufacturers that some devices have proven to reduce concussion (e.g., mouth guards, head bands). Unfortunately the research support is either non-existent or consistent lacking in support for such claims. Parents, children and sporting enthusiasts are lulled into a false sense of security regarding their protective gear, perhaps furthering their chances for injury.

Proposed Approach: The research goals to pursue should press the development of (1) a scientifically-based, objective system to identify the presence of mild TBI using integrative neuroimaging and neurobehavioral research tools at different stages of the lifespan, a task not previously attempted, and (2) a research-based intervention protocol that uses neuroimaging and neurobehavioral tools to monitor progress and rate of intervention effectiveness for mild TBI at different stages of life. This work would investigate the long-term consequences of earlier and repeated mild TBI, as well as the effectiveness of cognitive interventions with this population. Research with advanced aged former athletes could explore how TBI events relate to chronic traumatic encephalopathy (CTE), a progressive degenerative neural disease thought to result from a history of successive TBIs. To be most effective, these initiatives would require an interdisciplinary team of cognitive neuroscientists, cognitive and behavior scientists, geneticists, anthropologists, sociologists, endocrinologists, learning and memory specialists, statisticians, vestibular/auditory specialists, neurologists, occupational therapists, and developmental psychologists specializing in cognitive impairments, intervention techniques, and large data set analysis techniques.

This approach stands in stark contrast to previous efforts to study mild TBI that largely tracked behavior or a few brain measures over short time intervals (e.g., 2 hours to 6 weeks) following mild TBI. Few studies recorded baseline measures prior to injury needed to track changes in neurobehavioral functioning following concussion, and even fewer examined the effects of multiple mild TBIs, the time intervals between them, the g-force of the causal blow, or the site or direction of impact. Without preconcussion measures, researchers are unable to determine whether athletes actually recovered to their preconcussion levels of neurocognitive functioning. In sharp contrast, a longitudinal study would track all of these dimensions in our active youth, high school and college athlete populations. By comparing the neurobehavioral results of such individuals at different ages ranging from those in their early elementary school sport programs through the adult years to those in their late adult years, we will gain new insights into TBI diagnosis as well as short term and long term consequences, such as CTE. Importantly, we will have a unique opportunity to develop and test the effectiveness of neurocognitive intervention systems linked to well-specified information on mild TBI and CTE.

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Mr. TERRY. Thank you. Dr. Johnston, you are now recognized for 5 minutes.

STATEMENT OF JAMES JOHNSTON

Mr. JOHNSTON. Hi, Chairman Terry, Ranking Member Schakowsky, and members of the committee. Thank you for inviting me to testify before you today, alongside this illustrious panel about our experience in Alabama following the passage of concussion legislation, as well as the work we are currently doing at the University of Alabama Birmingham to improve sports safety.

As in the State of Nebraska, youth sports and youth football are an extremely important part of our culture, and as a result, we take the safety of our children very seriously as well.

As well known to the committee, the problem of concussion has gained prominence over the past decade thanks to important research and advocacy work done by scientists, physicians, and public health professionals at many centers across the United States, and through the work of public officials highlighting this research. Of significant concern, recent studies have identified potential long-term health consequences including depression, chronic traumatic encephalopathy and other neurodegenerative diseases associated with repeated impacts.

While college and professional football gets the most media attention, it is important to keep in mind that greater than 70 percent of all football players in the U.S. are under 14 years of age. Any effort directed at improving safety in football and other impact sports will need to address these youth athletes.

Parallel to enacting of Alabama's concussion law in 2011, as in many States, the Alabama State Concussion Taskforce, Children's of Alabama, and Think First Alabama, initiated a statewide concussion education and awareness program, and it worked. In that first year, we observed a 500 percent increase in referral of youth athletes referred to the Concussion Clinic at Children's of Alabama, a trend that has held steady since that time with about 350 youth athletes seen every year.

To optimize care of this rapidly increasing patient population, we developed a multidisciplinary protocol, it is in my Appendix 1, following the Zurich Consensus Guidelines, athletes were evaluated by physicians with expertise in concussion, kept out of sports or school until symptom-free, referred for neuropsychological testing when appropriate, and supervised in a gradually return to play and/or return to think program. A formal study performed in 2012 demonstrated that establishing this program resulted in significantly better concussion care and decreased institutional resource utilization.

Even though these efforts have certainly resulted in improved recognition and treatment of concussion in Alabama and in other States, we believe that much remains to be done in order to prevent sports-related brain injury in the first place. Given the difficulty of delineating a specific concussion threshold, as has been said previously, using existing helmet accelerometer technology and other subjective ways of evaluating athletes, researchers have begun to widen their focus from concussion to correlating cumulative impact exposure over time, with changes in advanced MRI

imaging techniques and neuropsychological changes, even in the absence of clinically diagnosed concussion. Animal models of subconcussive impacts have also demonstrated problems with complex spatial learning, cognitive impairment, and, as is seen also in football players, compared with single impact controls and those who have not had these injuries.

Though definitive conclusions about threshold for impact frequency hit counts cannot be drawn from these early studies, it has become clear that subconcussive impacts, that is, those impacts that don't result in concussion, also play a role in cumulative brain injury over time and need to be studied.

Recent studies of youth players by researchers at Wake Forest suggest that a significant portion of young players' head impact actually takes place during practices, and the largest impacts happen to take place during those practices, a lot of time doing outdated drills, like Oklahoma Drill or Bull in The Ring, that are supervised by well-meaning but untrained coaches. Emulating top level collegiate programs, which don't do these practices and these drills, teams like the University of Alabama, Ivy League and others, the Alabama High School Athletic Association recently published nonbinding guidelines to limit full contact hitting practices to twice per week. I believe this type of intervention is complimentary to the stuff that USA Football is talking about, about techniques, not just the techniques of hitting but also the number of hitting practices per week, as well as what drills are going to be done during practice. Pop Warner has instituted similar guidelines to this, but again, that is a small section. Limiting the frequency of hitting at practices as well as the type of drills would have a large effect on safety, significantly decreasing the cumulative impact exposure for every youth football player in America.

It has also become clear that football helmet standards currently defined by the National Operating Committee for Standards in Athletic Equipment must be updated to reflect or improve understanding of the etiologies of concussion. It is clear that both linear impact and rotational acceleration play a role in concussion pathophysiology, and only linear impact is studied by the NOCSAE system, which was from a skull fracture tolerance model developed in the 1960's.

We believe that having a more complete picture of the impacts that are seen in the football field are necessary in order to come up with meaningful standards. In collaboration with the University of Alabama Football Program, engineers at UAB, led by Dean Sicking, previously of the University of Nebraska, and the developer of the safer barrier for NASCAR and IRL have recently developed a robust video analysis system to analyze impacts, and then recreate them in a purpose-built lab.

In conclusion, the passage of concussion awareness legislation, community education, and recent advances in our understanding of head impact exposure in youth athletes have all improved the overall safety of impact sports, and that we are recognizing concussions more frequently, however, much work remains, specifically in concussion education, and drafting of policies to limit head impact exposure for youth athletes in contact sports. As part of this push to a multifaceted approach to a complex problem, I believe the devel-

opment of new helmet standards is also crucial for the development of safer helmets.

Mr. Chairman, thank you for the opportunity to testify.

[The prepared statement of Mr. Johnston follows:]

Testimony of Dr. James Johnston

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and
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Before the Commerce, Manufacturing and Trade Subcommittee
House Energy and Commerce Committee

Improving Sports Safety – A Multi-Faceted Approach

March 13, 2014

March 13, 2014

Summary Points

- Sports related concussion in youth sports has emerged as a significant public health issue
- Recent studies have identified potential long-term health consequences that may result from the cumulative effects of both concussive and subconcussive impacts
- The road to improving safety for youth athletes will require a multi-factorial approach, including education, rule changes, impact monitoring, improved diagnostic testing and treatment
- Passage of concussion legislation by the Alabama state legislature in 2011 resulted in a 500% increase in patients evaluated for concussion at the Children's of Alabama Concussion Clinic
- Establishment of a multidisciplinary protocol based on best practice guidelines resulted in improved concussion care and decreased use of institutional resources at Children's of Alabama
- Though concussion legislation has resulted in improved recognition and management of concussion in Alabama, primary prevention of sports-related brain injury has emerged as an important priority
- Recent studies of youth football players suggest that a significant proportion of youth head impact exposure takes place during practice, often during outdated drills that are no longer used at the collegiate and professional level
- Education of coaches, athletic trainers and athletic directors and guidelines limiting number of full impact practices and injurious drills can significantly decrease cumulative head impact exposure
- Existing NOCSAE helmet standards should be overhauled in order to reflect current understanding of concussion pathophysiology and foster improved helmet design
- In collaboration with the University of Alabama football program, engineers at UAB have developed a high definition video analysis system that can measure impact conditions for a wide range of collisions. These impact parameters can then be recreated in a high fidelity impact testing laboratory, informing more realistic helmet standards and improved helmet design

Chairman Terry, Ranking Member Shakowsky, and members of the committee: Thank you for inviting me to testify before your committee. I hope my comments regarding our experience in Alabama following concussion legislation are informative to the important work this committee has undertaken to look at Improving Sports Safety. The committee's approach in looking at multi-faceted approaches to this issue is the right way to address the matter and I appreciate the opportunity to contribute to your inquiry.

I am currently an assistant professor in the department of neurosurgery, University of Alabama-Birmingham and an attending pediatric neurosurgeon at Children's (Hospital) of Alabama, one of the nation's largest freestanding pediatric hospitals. With clinical and research expertise in traumatic brain injury, I am the medical director of ThinkFirst Alabama and Research Chairman for the Alabama State Concussion Task Force.

As this committee well knows, the problem of concussion has gained prominence over the past decade, thanks to important research and advocacy work done by scientists, physicians and public health professionals at many centers across the United States. The Centers for Disease Control estimates that between 1.6 and 3.8 million cases of sports-related concussion occur each year, with football having the highest rate of injury. Of significant concern, recent studies have identified potential long-term health consequences, including depression, chronic traumatic encephalopathy (CTE) and other neurodegenerative diseases, associated with repeated head impacts. These findings suggest that, over the long term,

significant damage may result from the cumulative effects of both concussive and sub-concussive injury.

As in many states, football has evolved as a major cultural institution in the state of Alabama, with high rates of participation by children starting as early as 8 years of age. The many positive attributes of the game include development of character, teamwork, and sportsmanship. Despite the focus placed on professional and collegiate football in media reports, it is important to keep in mind that greater than 70% of all football players in the US are under 14 years of age. Any efforts directed at improving safety in football will need to address these young players.

Given the above, successfully improving safety for youth athletes is crucial to the future of all impact sports, not just football. It has become clear that the road to improving safety will require a multi-factorial approach, including player and coach education, rule changes, impact monitoring, improved diagnostic tests and treatment. In addition, we believe that helmet performance standards will need to be overhauled in order to foster truly improved helmet design. Our experience in Alabama mirrors that of many other states, and provides insight about the initial successes of the concussion initiative as well as the remaining challenges on the road to improving safety in youth sports.

Concussion Legislation and its Consequences

Following a wave of similar measures around the country, in June 2011, both houses of the Alabama state legislature passed HB-108. The law states : "any youth

athlete who is suspected of sustaining a concussion or brain injury in a practice or game shall be immediately removed from participation (that day) and not allowed to return to play until evaluated by a licensed physician and until the athlete receives written clearance to return to play from a licensed physician." The product of several years of advocacy by the Alabama State Concussion Task Force, the measure also required that each local school system and governing body develop guidelines and other pertinent information to inform and educate youth athletes and their parents or guardians about concussion. Education of coaches was also mandated on a yearly basis, with a general curriculum that focused on recognition of concussion as well as requirements of the law.

Passage of the law coincided with a statewide media campaign by Children's of Alabama and ThinkFirst Alabama, aiming to educate parents, coaches, athletic trainers, teachers and administrators about the symptoms of concussion as well as the legal mandate for athletes with suspected concussion to be pulled from the field for medical evaluation. Not unexpectedly, physicians and emergency departments around the state saw a significant increase in referral of youth athletes for concussion care within weeks of passage of the law. The Concussion Clinic at Children's of Alabama in Birmingham, the state's only freestanding pediatric hospital, observed a 500% increase in the number of youth athletes referred for concussion between 2010 and 2011, a trend that has held steady since that time with more than 350 patients evaluated per year. Consistent with the experience of other major centers across the country, the majority of concussions were associated with football, lacrosse and soccer.

To optimize care of this rapidly increasing patient population, UAB and Children's of Alabama developed a multidisciplinary protocol (see Appendix 1) based on best practice guidelines from the Zurich Consensus Statement on Concussion in Sport (2008). After evaluation in the Emergency Department or local pediatricians' office, athletes were referred to the UAB Concussion Clinic at Children's of Alabama for standardized management. In addition to complete physical and neurological examination, patients underwent evaluation with the Sports Concussion Assessment Tool 2/3 (see Appendix 2). Athletes who had a history of multiple concussions, abnormal brain imaging or concomitant cervical spine injury were referred to a pediatric neurosurgeon (JJ). Again, following the Zurich consensus guidelines, athletes were kept out of sports or school until symptom free, then supervised in a graduated return to play and/or return to think program. Approximately 80% of all athletes had resolution of symptoms within 2 weeks; patients with persistent symptoms or neurocognitive issues were referred to a neuropsychologist and the formal traumatic brain injury program supervised by Physical Medicine and Rehabilitation.

A formal study performed in 2012 demonstrated that establishment of the multidisciplinary concussion program, with it standardized referral, management and treatment protocol, resulted in significantly better concussion care and decreased institutional resource utilization. Further analysis of more than 600 patients treated between 2011-2013 found that a previous history of concussion, low presenting SCAT2 score, previously diagnosed ADHD, female gender, and a

higher presenting SCAT2 symptom severity score were associated with a higher risk of prolonged (> 2 weeks) recovery from concussion.

Prevention of Sports Related Concussion

Though passage of the law, increased media reporting on the topic, and establishment of the multidisciplinary concussion program have all undoubtedly resulted in improved recognition and treatment of concussion in Alabama, it is clear that much remains to be done in order to prevent sports related brain injury in the first place. In football (and many other sports), there is a culture of toughness and sacrifice for the benefit of the team that discourages youth athletes from reporting symptoms and coaches from pulling players with possible injury. Though attitudes about this among coaches and parents have changed somewhat over time, it is clear from our and others' experience that many concussions still go undiagnosed, with significant consequences for these young athletes.

Recent studies by researchers at Wake Forest University and Virginia Tech following youth football players with helmet-mounted sensor systems have clearly demonstrated that the highest magnitude impacts may approach those seen at the high school level. Given the difficulty of delineating a specific concussion "threshold" using existing helmet accelerometer technology, researchers have begun to shift their focus from concussion to correlating impact exposure over time with advanced imaging techniques and neuropsychological changes. In this vein, researchers at Purdue University have demonstrated changes in functional MRI and

cognitive performance over time in football players, even in the absence of diagnosed concussion.

Importantly, studies suggest that a significant percentage of youth players' head impact exposure takes place during practice, oftentimes during outdated drills (supervised by well meaning but untrained coaches) that are no longer performed at the collegiate and professional level. As researchers' attention has turned to the long-term effects of sub-concussive impacts, especially in the developing brain, others and we have focused our efforts on persuasion of coaches, athletic trainers, and athletic directors to limit unproductive impact exposure in practice. Emulating top-level collegiate programs (including the University of Alabama), the Alabama High School Athletic Association recently published non-binding guidelines to limit full contact hitting practices to twice per week.

A recent study of youth players aged 9-12 years by researchers at Wake Forest demonstrated a 37-46% decrease in head impact exposure for players on the team that had instituted rule changes (based on recent Pop Warner mandates) which limited contact in practice to no more than 1/3 of weekly practice time and no more than 40 minutes of a single session devoted to hitting drills. Though it has not been demonstrated whether this also results in a decreased risk of concussion, common sense suggests that suffering 40% fewer impacts to the head over time is better than the alternative.

Given this new emphasis on sub-concussive impacts and head impact exposure over time, some experts have gone so far as to advocate the adoption of a "hit count," similar to the "pitch count" that has been so effective in youth baseball.

By shifting the focus from "concussion" to cumulative head impact exposure, a path to improving safety for youth athletes becomes much more apparent. Limiting the frequency of hitting practices as well as the types of drills done during practice (for example, proscribing Oklahoma drill, bull in the ring and other outdated and unproductive drills) would have the largest effect on safety, significantly reducing head impact exposure for every youth football player in America.

Development of Improved Helmet Performance Standards

In addition to all the above, it has also become clear that football helmet standards, currently defined by the National Operating Committee for Standards in Athletic Equipment (NOCSAE), must be updated to reflect our improved understanding of the etiologies of concussion. Primate studies, finite element modeling, and in vivo helmet accelerometer studies have all demonstrated a role for both linear impact and rotational kinematics in the pathophysiology of concussion. Despite this knowledge, the current NOCSAE standard measures only linear impact protection based on a skull fracture tolerance model developed in the 1960's. The recent Virginia Tech STAR system has been a very important (and controversial) contribution to the ranking of helmet designs based on attenuation of linear impact, and recent work by the same group suggests a lower rate of concussion in players wearing a modern day helmet (like the Riddell Revolution) compared with those wearing a traditional model (like the Riddell VSR).

As mentioned above, when current helmet performance standards were developed, the primary objective was preventing skull fracture, and the testing procedures were never intended to examine the risk of concussion. Further, existing helmet performance standards are based upon a simple drop test of a helmeted head form onto a rigid plate. This testing is not now, nor has it ever been, representative of helmet impacts at any level of football. Further, the testing procedures do not include any rotational loading and therefore do not examine rotational accelerations of the head, which are known to be a primary contributor to concussion.

The severity of on-field collisions is related to a number of impact characteristics, including *closing velocity*, *impact point on the helmet*, *player mass*, and *player body alignment.* All of these parameters affect the peak g-loading and velocity change applied to a player's head during on-field impacts. If the risk of player injury is to be measured with any degree of accuracy, all of these impact characteristics must be represented during testing. These important impact parameters have never been accurately measured for any of the popular contact sports, including football, hockey, and lacrosse. These critical indicators of impact severity must be precisely measured in order to provide even the most rudimentary evaluation of a helmet's capability for reducing TBI.

Almost all recent studies of on-field impacts have incorporated accelerometers attached to players' helmets, ears, or mouthpieces. Accelerometer data have been collected on more than 1.5 million helmet-to-helmet and helmet-to-ground impacts. Although these impacts have shed light on the magnitude of

accelerations experienced by football players at every level, there is a great deal of important information that cannot be collected using accelerometers alone.

Even when properly designed, helmet/head accelerometers and rotational rate transducers can only measure translational and rotational accelerations and velocity changes. Other critical parameters, including closing velocity, specific point of impact, helmet orientation at impact, body mass, and body orientation must be identified by another means. These parameters are best quantified through photogrammetric analysis of game videos. The move to high-definition video and improvements in video analysis technologies have greatly improved both the accuracy and the degree of automation possible with photogrammetric reconstruction of videos from football games. In collaboration with the University of Alabama football program, engineers at UAB have recently developed a robust video analysis software suite that can measure all of these critical parameters for a given impact from two-angle coaching film (see Appendix 3). These parameters can then be used to inform a spectrum of realistic impact reconstructions in the laboratory, with a commensurate ability to study these impacts in detail (see Appendix 4).

The only way to assure that all relevant impact parameters are properly evaluated is to develop a testing system that is as close to real world collisions as possible. The testing protocol must provide accurate and consistent re-creations of on-field impacts, and it must be able to evaluate the interactions between two different helmet designs. Variations in both impact frequency and magnitude from one player position to the next, and for youth vs. high school vs. collegiate level

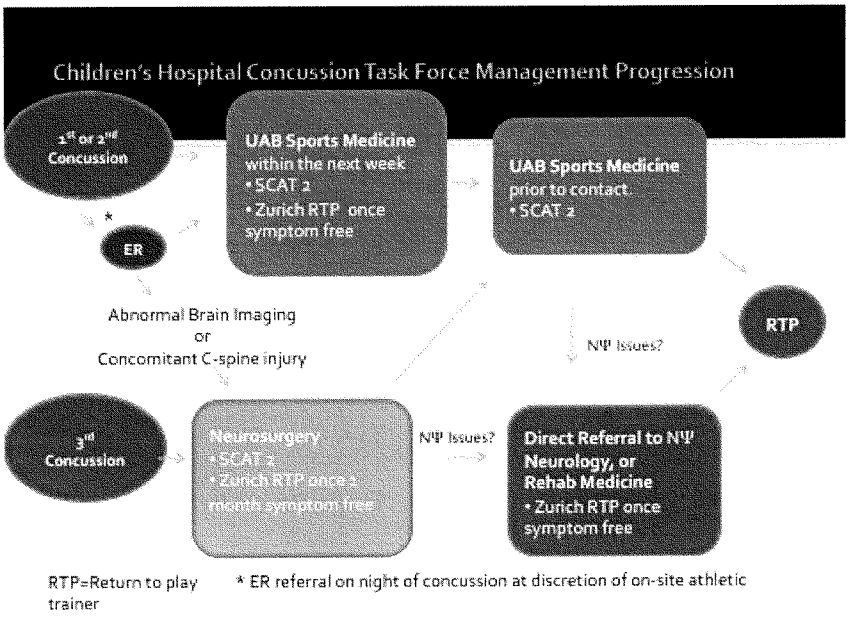
players are also undoubtedly crucial. For example, linemen experience some degree of helmet impact during almost every play. However, these impacts involve relatively low speeds. On the other extreme, kick returners and wide receivers experience far fewer impacts, but the severity of these impacts can be several times higher than those experienced by linemen. Nevertheless, the possibility must be kept in mind that numerous, low severity collisions may be as injurious as infrequent, high-speed collisions.

Conclusion

The passage of concussion legislation, community education and recent advances in our understanding of head impact exposure in youth athletes have all undoubtedly improved the overall safety of impact sports like football. Nonetheless, much work remains, specifically in the education of coaches/trainers and drafting of policies to limit unnecessary head impact exposure in practice for youth athletes. As part of this multifaceted approach to a complex problem, the development of new helmet standards based on realistic impact conditions is crucial for the development of safer helmets.

Mr. Chairman, thank you for the opportunity to testify and I look forward to your questions.

Appendix 1: Children's of Alabama Multidisciplinary Concussion Management Protocol



Appendix 2: Sports Concussion Assessment Tool 3 (SCAT3)

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SCAT3™

Sport Concussion Assessment Tool – 3rd Edition

For use by medical professionals only

Name | Date/Time of Injury: Date of Assessment: | Examiner:

What is the SCAT3?[1]

The SCAT3 is a standardized tool for evaluating injured athletes for concussion and can be used in athletes aged from 13 years and older. It supersedes the original SCAT and the SCAT2 published in 2005 and 2009, respectively[1]. For younger persons, ages 12 and under, please use the Child SCAT3. The SCAT3 is designed for use by medical professionals. If you are not qualified, please use the Sport Concussion Recognition Tool[2]. Preseason baseline testing with the SCAT3 can be helpful for interpreting post-injury test scores.

Specific instructions for use of the SCAT3 are provided on page 3. If you are not familiar with the SCAT3, please read through these instructions carefully. This tool may be freely copied in its current form for distribution to individuals, teams, groups and organizations. Any revision or any reproduction in a digital form requires approval by the Concussion in Sport Group.

NOTE: The diagnosis of a concussion is a clinical judgment, ideally made by a medical professional. The SCAT3 should not be used solely to make, or exclude, the diagnosis of concussion in the absence of clinical judgement. An athlete may have a concussion even if their SCAT3 is "normal".

What is a concussion?

A concussion is a disturbance in brain function caused by a direct or indirect force to the head. It results in a variety of non-specific signs and/or symptoms (some examples listed below) and most often does not involve loss of consciousness. Concussion should be suspected in the presence of **any one or more** of the following:

- Symptoms (e.g., headache), or
- Physical signs (e.g., unsteadiness), or
- Impaired brain function (e.g. confusion) or
- Abnormal behaviour (e.g., change in personality).

SIDELINE ASSESSMENT

Indications for Emergency Management

NOTE: A hit to the head can sometimes be associated with a more serious brain injury. Any of the following warrants consideration of activating emergency procedures and urgent transportation to the nearest hospital:

- Glasgow Coma score less than 15
- Deteriorating mental status
- Potential spinal injury
- Progressive, worsening symptoms or new neurologic signs

Potential signs of concussion?

If any of the following signs are observed after a direct or indirect blow to the head, the athlete should stop participation, be evaluated by a medical professional and **should not be permitted to return to sport the same day** if a concussion is suspected.

Any loss of consciousness?	☐ Y ☐ N
"If so, how long?"	
Balance or motor incoordination (stumbles, slow/laboured movements, etc.)?	☐ Y ☐ N
Disorientation or confusion (inability to respond appropriately to questions)?	☐ Y ☐ N
Loss of memory:	☐ Y ☐ N
"If so, how long?"	
"Before or after the injury?"	
Blank or vacant look:	☐ Y ☐ N
Visible facial injury in combination with any of the above:	☐ Y ☐ N

1 Glasgow coma scale (GCS)

Best eye response (E)	
No eye opening	1
Eye opening in response to pain	2
Eye opening to speech	3
Eyes opening spontaneously	4
Best verbal response (V)	
No verbal response	1
Incomprehensible sounds	2
Inappropriate words	3
Confused	4
Oriented	5
Best motor response (M)	
No motor response	1
Extension to pain	2
Abnormal flexion to pain	3
Flexion/Withdrawal to pain	4
Localizes to pain	5
Obeys commands	6
Glasgow Coma score (E + V + M)	of 15

GCS should be recorded for all athletes in case of subsequent deterioration.

2 Maddocks Score[3]

"I am going to ask you a few questions, please listen carefully and give your best effort."

Modified Maddocks questions (1 point for each correct answer)

What venue are we at today?	0	1
Which half is it now?	0	1
Who scored last in this match?	0	1
What team did you play last week/game?	0	1
Did your team win the last game?	0	1
Maddocks score		of 5

Maddocks score is validated for sideline diagnosis of concussion only and is not used for serial testing.

Notes: Mechanism of injury ("tell me what happened"?):

Any athlete with a suspected concussion should be REMOVED FROM PLAY, medically assessed, monitored for deterioration (i.e., should not be left alone) and should not drive a motor vehicle until cleared to do so by a medical professional. No athlete diagnosed with concussion should be returned to sports participation on the day of injury.

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BACKGROUND

Name: Date:
Examiner:
Sport/team/school: Date/time of injury:
Age: Gender: M F
Years of education completed:
Dominant hand: right left neither
How many concussions do you think you have had in the past?
When was the most recent concussion?
How long was your recovery from the most recent concussion?
Have you ever been hospitalized or had medical imaging done for a head injury? Y N
Have you ever been diagnosed with headaches or migraines? Y N
Do you have a learning disability, dyslexia, ADD/ADHD? Y N
Have you ever been diagnosed with depression, anxiety or other psychiatric disorder? Y N
Has anyone in your family ever been diagnosed with any of these problems? Y N
Are you on any medications? If yes, please list. Y N

SCAT3 to be done in resting state. Best done 10 or more minutes post-exertion.

SYMPTOM EVALUATION

3 How do you feel?

"You should score yourself on the following symptoms, based on how you feel now".

	none	mild		moderate			severe
Headache	0	1	2	3	4	5	6
"Pressure in head"	0	1	2	3	4	5	6
Neck Pain	0	1	2	3	4	5	6
Nausea or vomiting	0	1	2	3	4	5	6
Dizziness	0	1	2	3	4	5	6
Blurred vision	0	1	2	3	4	5	6
Balance problems	0	1	2	3	4	5	6
Sensitivity to light	0	1	2	3	4	5	6
Sensitivity to noise	0	1	2	3	4	5	6
Feeling slowed down	0	1	2	3	4	5	6
Feeling like "in a fog"	0	1	2	3	4	5	6
"Don't feel right"	0	1	2	3	4	5	6
Difficulty concentrating	0	1	2	3	4	5	6
Difficulty remembering	0	1	2	3	4	5	6
Fatigue or low energy	0	1	2	3	4	5	6
Confusion	0	1	2	3	4	5	6
Drowsiness	0	1	2	3	4	5	6
Trouble falling asleep	0	1	2	3	4	5	6
More emotional	0	1	2	3	4	5	6
Irritability	0	1	2	3	4	5	6
Sadness	0	1	2	3	4	5	6
Nervous or Anxious	0	1	2	3	4	5	6

Total number of symptoms (Maximum possible 22)
Symptom severity score (Maximum possible 132)

Do the symptoms get worse with physical activity? Y N
Do the symptoms get worse with mental activity? Y N

self rated self rated and clinician monitored
clinician interview self rated with parent input

Overall rating: If you know the athlete well prior to the injury, how different is the athlete acting compared to his/her usual self?

Please circle one response:

no different very different unsure N/A

Scoring on the SCAT3 should not be used as a stand-alone method to diagnose concussion, measure recovery or make decisions about an athlete's readiness to return to competition after concussion. Since signs and symptoms may evolve over time, it is important to consider repeat evaluation in the acute assessment of concussion.

COGNITIVE & PHYSICAL EVALUATION

4 Cognitive assessment

Standardized Assessment of Concussion (SAC)*

Orientation (1 point for each correct answer)

What month is it?	0 1
What is the date today?	0 1
What is the day of the week?	0 1
What year is it?	0 1
What time is it right now? (within 1 hour)	0 1
Orientation score	of 5

Immediate memory

List	Trial 1		Trial 2		Trial 3	Alternative word list		
elbow	0	1	0	1	0	1	candle	baby	finger
apple	0	1	0	1	0	1	paper	monkey	penny
carpet	0	1	0	1	0	1	sugar	perfume	blanket
saddle	0	1	0	1	0	1	sandwich	sunset	lemon
bubble	0	1	0	1	0	1	wagon	iron	insect
Total									

Immediate memory score total of 15

Concentration: **Digits Backward**

List	Trial 1	Alternative digit list		
4-9-3	0 1	6-2-9	5-2-6	4-1-5
3-8-1-4	0 1	3-2-7-9	1-7-9-5	4-9-6-8
6-2-9-7-1	0 1	1-5-2-8-6	3-8-5-2-7	6-1-8-4-3
7-1-8-4-6-2	0 1	5-3-9-1-4-8	8-3-1-9-6-4	7-2-4-8-5-6
Total of 4				

Concentration: **Month in Reverse Order** (1 pt. for entire sequence correct)

Dec-Nov-Oct-Sept-Aug-Jul-Jun-May-Apr-Mar-Feb-Jan 0 1

Concentration score of 5

5 Neck Examination:

Range of motion Tenderness Upper and lower limb sensation & strength

Findings:

6 Balance examination

Do one or both of the following tests.

Footwear (shoes, barefoot, braces, tape, etc.)

Modified Balance Error Scoring System (BESS) testing[1]

Which foot was tested (i.e. which is the **non-dominant** foot) Left Right

Testing surface (hard floor, field, etc.)

Condition

Double leg stance: Errors
Single leg stance (non-dominant foot): Errors
Tandem stance (non-dominant foot at back): Errors

And / Or

Tandem gait[6,7]

Time (best of 4 trials): seconds

7 Coordination examination

Upper limb coordination

Which arm was tested: Left Right

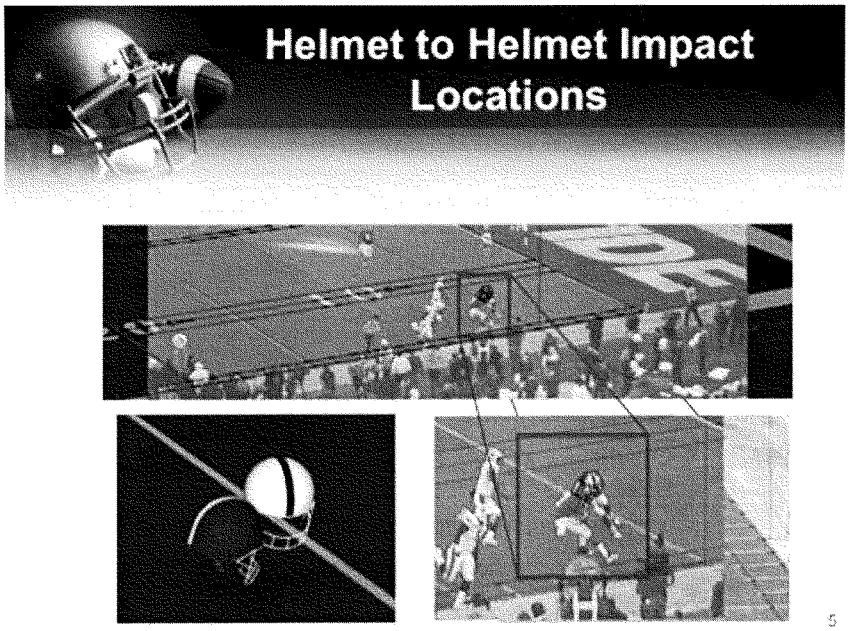
Coordination score of 1

8 SAC Delayed Recall[4]

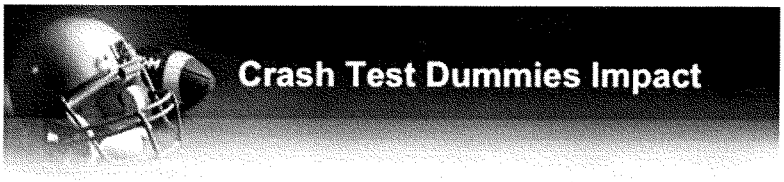
Delayed recall score of 5

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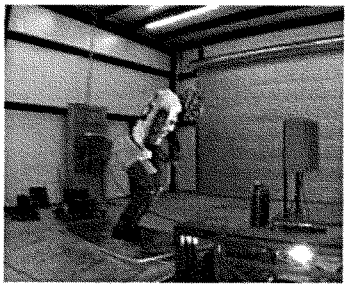
Appendix 3: High Resolution Photogrammatic Impact Analysis

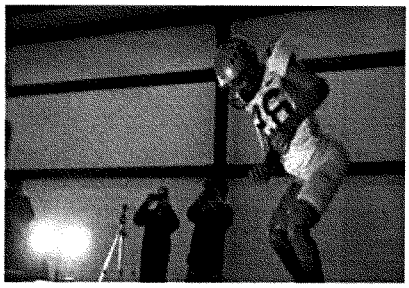


Appendix 4: Impact Reconstruction in UAB Laboratory



Launch Sled: controls speed, body orientation, and helmet impact locations.





10

Mr. TERRY. Thank you. Dr. Gay, you are now recognized for 5 minutes.

STATEMENT OF TIMOTHY J. GAY

Mr. GAY. Thank you, Chairman Terry. I would like to thank the subcommittee for inviting me to testify today.

I am speaking to you as a football fan who happens to be a physicist. My main professional interest in the game is the understanding of how protective equipment works and how it can be improved.

Today I wish to consider several aspects of football that are problematic as far as concussions go, and how we might move forward to make the game safer.

American football is an inherently violent sport. That is one of the reasons we love it. The forces encountered in football can be huge. Consider a big hit between a running back and a linebacker at full speed. We can show, using Newton's Second Law, that the force each player exerts on the other exceeds ¾ of a ton. This is why football is called a contact sport.

Two players who collide at full speed, helmet to helmet, are experiencing the same force to their heads that one of them would feel if he had a 16-pound bowling ball dropped on his helmet from a height of 8 feet.

Medical knowledge of concussions is in its infancy, but we know one thing for sure: Forces to the head and neck cause concussions, and we have just heard how big these forces can be. Here is another problem: They are getting bigger.

Since 1920, the average weight of pro linemen has increased almost 60 percent, to just over 300 pounds. At the same time, these players have gotten about 10 percent faster. Combining the factors of speed and mass to calculate kinetic energy, the energy available to cause injury, we find that the amount of energy dumped into the pit at the line of scrimmage on any given play has almost doubled since 1920. In exact opposition to this trend is the fact that players are shedding their protective gear. Thigh and kneepads that used to be centimeters thick, now bear a remarkable resemblance to teacup doilies. Horse collars, popular with linemen of my generation, have gone the way of the flying wedge. Modern football helmets are technological marvels, but players choose them not for their collision cushioning ability, but for how cool they look.

Another problem is the poor state of our medical knowledge. While I am not competent to explain these issues, I think it is safe to say that a room full of head trauma physicians will not agree on the details of what concussions are, or what causes them. This means that the diagnosis and treatment of concussions has a long way to go. As our understanding of these issues improves, we may find that injury rates due to the increasing energy of the game and the wholesale shedding of equipment have increased faster than we thought.

Finally, football is big business, especially at the college and professional levels. When monetary forces manifest themselves as they do in, for example, bounty programs and illegal doping to improve performance, the game becomes more dangerous.

What are the solutions? We need better equipment, but this can get tricky. For example, it is apparent that adding more energy absorbing foam to the outside of a helmet will lower the force delivered to a player's skull. This has been tried in the past. The problem is that the added padding increased the helmet diameter, as well as its coefficient of friction, meaning that the opposing player can exert a lot more torque on your head. Nonetheless, several companies today are proposing the same basic padding idea for youth football, for whose players the risk of collisions to the head is almost certainly greater. The use of the Star System for rating helmets, and the Hit System for monitoring collisions to a player's head, represent important first steps toward improving football safety for a variety of reasons that disregard players' safety, they are largely ignored.

Our understanding of the physiological and epidemiological issues related to concussions must be improved. There is now an understanding in the NFL and at the college level that significant research in this area is needed. Several of the members of this panel, including my colleague from Nebraska, Dr. Molfese, are leading cutting-edge efforts in this area.

Finally, some incremental rule changes and more stringent enforcement of existing rules are needed. In my opinion, some of the new rules regarding targeting, peel-back blocking, and definition of a defenseless opponent, are making players more hesitant on the field. These rules may, thus, actually, increase the risk of injury. Rule changes should be studied and possibly reversed.

It is my belief that a return to the level of padding worn in the 1970s would make the game significantly safer. More thorough doping rules should be developed and actually enforced. The NFL season should be reduced to 14 games, and the college season returned to 11. Finally, more stringent requirements regarding when a player with a concussion can return to the game need to be implemented.

These are my thoughts for your consideration. Thank you for your attention and your valuable time.

[The prepared statement of Mr. Gay follows:]

American Football
Problems and Solutions

Testimony Presented Before the U.S.Congress House SubCommittee on Commerce, Manufacturing, and Trade

13 March 2014

Timothy J. Gay, Ph.D.
Professor, Department of Physics and Astronomy
University of Nebraska-Lincoln

Fueled by well-publicized lawsuits and sensational stories in the press about former football players suffering from a variety of neurological disorders, there is increasing concern among many that American football is a dangerous sport. (I use the adjective "American," because, in our increasingly diverse society, "football" is often taken to mean "soccer.") Many important public figures have weighed in on this topic:

> "You see how hard the 'reforming the game' argument is going to be? Every time someone comes up with one thing that might reduce brain impacts, it seems to raise another problem. My guess? Football slowly dies out....look at the collateral damage this game has left in its wake. You have to ask the question, is it time to say enough?"
> - *Malcolm Gladwell (one of* Time *Magazine's 100 Most Influential People – 2005)*

> "That's because college football has no academic purpose, which is why it needs to be banned. A radical solution, yes – but necessary in today's times."
> - *Buzzy Bissinger (Pulitzer Prize Winner and author of* Friday Night Lights*)*

> "I have to tell you -- if I had a son, I'd have to think long and hard before I let him play football."
> - *President Barack Obama*

Actually, these concerns are not new. Early in the 20th century, in the days of the flying wedge when the game had no penalties whatsoever, football was considered by some to be the moral

equivalent of lynching. In 1908, before the days of professional football teams such as the Decatur Staleys and the Massillon Tigers, 19 college players died as a result of their exploits on the field. This prompted the *New York Times* to opine:

> "A young gentleman engaged in getting an education ought not to exhibit himself for money, and he and his fellows ought not to raise a mere sport to the dignity of an occupation. The tremendous loss of time which overattention to football occasions is its worst feature, though the brutality and maiming are serious evils too. Both will be cured by cutting off the money supply, which the Faculties can do with a two-line resolution. Make lynching expensive and public football unprofitable."
>
> -Two Curable Evils, New York Times *1908*

President Eliot of Harvard had similar views:

> [The rules of football] "are justifiable in that consummate savagery called war, but they should have no place in sport. No sport is wholesome in which ungenerous or mean acts which easily escape detection contribute to victory."
>
> -- *Harvard President Charles Eliot, 1903*

As a result of these concerns, President Theodore Roosevelt convened, in that year, an august group at the White House comprising, among others, the Secretary of State and the Athletic Directors from Harvard, Yale, and Princeton. This meeting resulted in the birth of the National Association of Collegiate Athletics (NCAA) and the institution of the forward pass, the line of scrimmage, and the required use of helmets and pads. The NCAA, as well as the National Football League (NFL), are now embroiled in efforts to solve the football problem - to make our American game of football safe.

What exactly is the problem and what are its causes? Before I go into specifics, and in the interests of full disclosure, I would like to make it clear that I am an advocate, in large part, of the status quo, and that my hope for the future of the game of football is that it will remain largely unchanged by the current controversy. I also wish to disclose that I am currently a consultant for Pro Sports Technologies, a football helmet development company in which I hold equity, and that I have worked in the past for Schutt Sports, a manufacturer of, among other sports-related equipment, football helmets. The opinions I present here, however, are mine alone, and do not necessarily represent the positions of the companies I mentioned or my employer, the University of Nebraska - Lincoln.

I come at this from a physicist's perspective. Let's begin with the basic problem. Football is a violent game; that's one of the things we love about it. When one watches a game of football, the action on the field – the blocking, tackling, and passing - are all governed by the laws of classical physics discovered by Isaac Newton in the 17th century. To review, Newton's First Law says that a mass will continue forever in its state of motion, changing neither its speed nor direction, unless it is acted upon by an external force. His Second Law quantifies this idea by relating that external force mathematically to the mass' rate of change of its velocity - it's acceleration. Finally, Newton's Third Law says that when two bodies interact, for example, when two football players collide with each other, the force exerted by player A on player B is equal in magnitude, but opposite in direction to the force exerted by player B on player A.

These laws may seem obvious at first, and in some applications they are, but they have counterintuitive aspects as well. Consider, for example, a hypothetical hit involving Doug

Flutie, whose playing weight was 180 pounds dripping wet, and Warren Sapp, the 330-pound Hall-of-Fame defensive end who was extraordinarily quick and a vicious tackler. Flutie has set up in the pocket to pass, and Sapp is bearing down on him at top speed like a ton of bricks (I use this analogy advisedly, as we will soon see). As Sapp sacks Flutie, which player exerts a bigger force on the other? Newton's Third Law tells us that they exert the *same* force on each other, albeit in opposite directions. So why is Flutie the one that goes flying after the hit? Newton's Second Law reveals the answer. Having less mass, Flutie is more easily accelerated, and the force that Sapp applies to him launches Flutie in a high speed trajectory off his feet. The equal force Flutie applies to Sapp acts only to slow him down as he and Flutie collide.

The forces encountered in football, especially at the professional and college levels, can be huge. Consider a big hit between a running back and a charging linebacker. They collide at full speed, and both fall to the ground. We can show, by the application of Newton's Second Law, that the force one player exerts on the other exceeds three-quarters of a ton (more than 1500 pounds!). This is why they call football a "contact" sport. Two players who collide at full speed helmet to helmet are essentially experiencing the same forces to their heads that one of them would feel had he had a 16-pound bowling ball dropped on his head from a height of eight feet. When you are a running back, making a guy miss is good – unless he grabs your facemask on the way by. Then, your neck experiences a torque about like the one it would had you jammed your head into an industrial washing machine full of wet towels at full rotation.

Forces to the head and neck can cause concussions, and we have just heard how big they can be. Another problem is that the forces involved in American football are getting bigger. Since 1920,

the average weight of professional football lineman has increased by almost 60% from 190 pounds to over 300 pounds. Using basic kinesiological models of sprinting, I have determined that their top-end speeds have increased over the same time period by almost 10%. Combining the factors of speed and mass to calculate kinetic energy – the energy available to cause injury – we can show that the amount of energy dumped into the pit at the line of scrimmage on any given play has almost doubled in the years since the NFL began. This is shown in Figure 1.

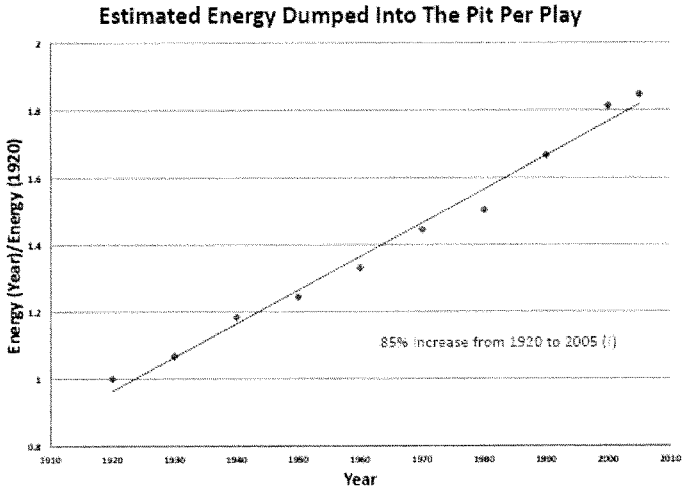


Figure 1. *Kinetic energy (energy that can produce an injury) in a typical play from scrimmage .*

Given the size of the forces about which we have been talking, and the fact that they are getting bigger every year, we might ask, "Why aren't players get injured with increasing frequency?" There are two major factors to consider here. The first involves football equipment. Equipment technology has improved dramatically in the last century. In the beginning, there *were* no

shoulder pads. By the 1920s, shoulder pads had evolved to strips of cotton batting over which one pulled his jersey. Now we have teams of mechanical engineers producing light, sophisticated shoulder pads. The earliest football helmets, introduced at about the time of the Taft administration, were essentially leather skull caps. Today, football helmets have very sophisticated designs with multiple foam layers, quick-release chinstraps, protective visors, and conformal polycarbonate shells. Barring a major technological breakthrough, it is accurate to say that football equipment is about as good as skill, craftsmanship, and science can make it.

The countertrend to the impressive technological prowess that has been brought to bear on this problem is that players, in the desire to be faster and more agile, are shedding equipment. Decisions about which helmet to wear, usually up to the player at the elite levels of the game, are based more often on how cool the helmet looks, not on its collision-cushioning ability. The venerable horse collar, an almost sure bet to eliminate concussions due to severe neck rotation, and a standard equipment item for players of my generation, has essentially been eliminated from the game. The reason? Linemen and other players do not like the limitations it poses to their ability to quickly swivel their heads to keep an eye on opposing players. Knee and thigh pads, that used to be substantially thicker than a centimeter, now often bear a remarkable resemblance to a teacup saucer pads.

A second, crucially important factor, is the poor state of our medical knowledge about what concussions actually are and what causes them. This is a very complicated problem, and the answers are affected by a player's physical and genetic disposition for suffering a concussion. The answers require an understanding of the physics and physiology of mechanical stresses on

the brain and spine, as well as their consequences at the cellular level. The state of this understanding is in its infancy. Right now, it is impossible to predict the concussive effect of a blow to a given part of the head or neck with a given force and torque. Much is made of the relative importance of direct blows to the head that cause linear acceleration versus glancing blows that result in rotational acceleration of the brain about the axis of the spine. But there exist to my knowledge no conclusive epidemiological studies that tell us which is worse. As our understanding of these physiological issues improves, we may in fact find that injury rates due to the increasing energy of the game and the shedding of equipment have increased faster than we thought. It is crucial that extensive, carefully done medical research be done to get at the heart of these questions.

So, succinctly, what are problems and challenges that American football faces?

1) The forces on the players are big and getting bigger.

2) Players are shedding their gear.

3) Increasing understanding of the physics and physiology of concussions is raising awareness of potential long-term medical problems resulting from violent sports. Of course, medical knowledge is also the solution to these problems.

4) Football is big business, especially at the college and professional levels. When monetary forces become manifest in how the game is played, as they do in, for example, bounty programs and illegal doping to improve performance, the game become more dangerous.

What are the solutions? In my opinion, the following measures will help maintain the integrity of the game of football, and minimize, to the extent possible, the physical danger of this inherently violent sport.

1) We need better equipment, but there are constraints here. Marginal improvements are to be gained in the area of better body, arm, and leg padding. More important is protection for the head and neck. But improving helmet performance is a tricky business. It is apparent that adding more energy-absorbing foam to a helmet will lower the maximum forces delivered to a player's skull, and thus reduce the risk of a concussion. This has been tried in the past. The Pro Cap was perhaps the most visible example of the "added foam" idea to ward off concussive blows. You may remember NFL players in the late 80s and early 90s roaming the field with helmets sporting large foam rubber tops – making them look a bit like visitors from another planet. The problem is that whenever padding is retrofitted to the outside of a helmet, its diameter increases, and the torque that can be applied by a glancing blow is subsequently increased. This dramatically increases the risk of neck injuries. Nonetheless, several manufacturers today are proposing the same basic idea for youth football, where the risk of collision to the head is almost certainly riskier. There is a good reason, other than the cosmetic one, why equipment room managers shine up the exterior of helmets to make them really slick.

The use of the Star system, developed at Virginia Tech, that gives a simple numerical rating for a helmet's impact performance, is a good first step in helmet assessment. There is, in my opinion, significant room for the improvement of this system, but it is undergoing ongoing

development and is the currently the best tool we have for analyzing the merits of various helmet systems.

Helmet telemetry systems (e.g., the Head Impact Telemetry, or HITS System), in which *in situ* helmet accelerometers are used to determine the orientation and severity of blows to the head in real time, should be used more widely. If nothing else, these systems would give us a wealth of data about the consequences of blows to the head in game and practice situations. Attempts to implement such systems in the NFL have been stalled because of the concern by players that data indicating a severe blow might be used to limit playing time or adversely affect salary negotiations. Expense and concern about lawsuits may be limiting the use of such systems at the college level.

2) Our understanding of the medical issues related to concussion must be dramatically improved. The NFL is now providing significant funding for research of this type. The Department of Defense, understanding the importance of traumatic brain injury (TBI) suffered by warfighters in combat, has been funding work in this area as well. Better coordination of these efforts is crucial. My academic home, the University of Nebraska-Lincoln, has launched a pioneering collaboration between athletics and academic research to understand at a fundamental level the nature of concussions and how they are linked to variables in athletic performance. The combination of research in brain biology, neurological links to behavioral issues and athletic performance, and the development of better, more rapid concussion diagnostic tools, carried out collaboratively by the Center for Brain, Biology, and Behavior (CB^3)

and the Nebraska Athletic Performance Lab (NAPL) and all housed in Memorial Stadium on our campus, is unique in academics and should serve a guide for academic research in this area.

3) Some incremental rule changes, and more stringent enforcement of existing rules, are needed. In my opinion, some of the new rules regarding targeting, peel back blocking, and defenseless players are making players more hesitant on the field, and thus actually increase the risk of injury in a game. These should be modified or eliminated. One hall of fame running back perhaps put it best:

> "If I'm a running back, and I'm running into a linebacker, you're telling me I have to keep my head up so he can take my chin off?"
>
> - *Emmitt Smith (NFL all-time leading rusher)*

It is my belief that a return to the level of padding worn in the1970s would make the game significantly safer. Until a better understanding of the effect on the brain of smaller but repetitive blows is attained, horse collars should be required, at least for linemen. More thorough doping rules should be developed and more aggressively enforced. The NFL season should be reduced to 14 games, and the college season returned to 11. Finally, more stringent requirements regarding when a player who has suffered a concussion can return to the game need to be implemented.

Mr. TERRY. Thank you for your valuable time.

And, Dr. Gioia, I appreciate you being here. You are recognized for 5 minutes.

STATEMENT OF GERARD A. GIOIA

Mr. GIOIA. Yes. Thank you, Chairman Terry, Ranking Member Schakowsky, and members of the subcommittee. I appreciate the opportunity to speak on behalf of the safety of our children in this country.

So I am a pediatric neuropsychologist at Children's National Health System here in Washington, DC, and the director of the SCORE Concussion Program. I am a clinician, a researcher, and a public health educator. Today I would like to take my time to focus my comments on the importance of public health education for youth concussion, using my expertise as a clinician and a researcher, and I have worked for the last decade with the CDC on their Heads-up Concussion Program materials.

We all know, and I think Ian said it just perfectly, that sports and recreation provide important developmental opportunities to enrich the lives of our youth. They teach life lessons. But we have to balance those incredible benefits of sports participation with careful attention to safety issues, and science must drive our action-oriented approach.

Concussions are serious injuries to the brain that threaten the development of our youth. In an attempt to protect our youth, we now have laws in all 50 States and the District of Columbia, all with the good intent of protecting our student athletes through rules for educating coaches and parents, and removing suspected concussions, and not allowing them to return until properly cleared. All States include the high school at this level, but only 15 out of those 51 include youth sports. So less than ⅓ are looking at the majority of athletes.

In preparing for this testimony, I was posed with an important question and challenge within youth sports. With concussion awareness now at an all-time high, are youth sports teams and organizations, and parents, more aware but still not sure what to do about it. And the simple answer to that question, with my experience, is yes. Many coaches and parents are not equipped to know what to do with a suspected concussion. Mechanisms to teach active recognition and response to every coach and parent are inconsistent and limited in scope. The health and safety of youth athletes is largely in the hands of coaches and parents at the youth level. They need medically guided training and early identification of concussion and protection. Coaches and parents must receive training and action-oriented concussion recognition and response. Awareness isn't enough, and they have to be prepared properly.

We know that, as you have heard, repeated concussions present the greatest challenge to our youth. So our greatest challenge is really the universal consistent and effective implementation of these 51 laws so that we can prepare those coaches and parents to know what to do, and have the tools with which to do it.

At Children's National Health System, over the past 10 years, our SCORE Program has delivered hundreds upon hundreds of action-oriented parent and coach concussion education and training

program, using the Heads-up materials from the CDC. We have learned much about the community needs and how to deliver the message. So we deliver scenario-based training where we present to coaches and parents an actual situation, and what they must do to recognize and respond. This is all very, very important as we put these responsible adults in place.

You have heard about some important other kinds of activities and good examples of head-safe action, head-smart action, such as USA Football's Heads-up Tackling Program, where coaches are educated in concussion recognition and response, but also taught techniques that we believe can improve taking the head out of the game, but we have to go further in all youth sports. We do not have a coordinated universal strategy at this point for action-oriented, solution-driven methods to recognize and respond to these injuries. We have the tools, we have many of the programs, but we do not at this point have the delivery mechanism to do that. So we have to build also on active partnerships between youth sports organizations and medical care systems. Concussions are complicated. They are not simple. We are not asking parents and coaches to be clinicians and to go out and diagnose. We have willing teammates, as you have heard, through USA Football, U.S. Lacrosse, USA Hockey, USA Rugby and other organizations, but we need to build those partnerships, we need the help of the professional sports leagues, as you hearing from the NHL and the NFL and the sports manufacturing world, to team with us. We also need a quarterback ultimately to make this happen. We have to leverage the efforts of other organizations like the National Council on Youth Sports Safety, the Youth Sports Safety Alliance, The Sarah Jane Brain Foundation's PABI Plan, all of this is important for us to do. So we need, obviously, funding to do that to move forward.

Can we move from awareness to action? Yes, we can. Concussions are serious injuries that threaten our youth, but we do not need to be scared away from that, we do not need to avoid developmentally appropriate participation in sports activities. What we need to do is focus on how to teach recognition and response, and our country needs a good universal mechanism to implement community focused youth concussion solutions, and we believe that that can help children ultimately as they enjoy the benefits of sports.

Our SCORE motto applies here. It says, "Play hard, play safe, but play smart."

Thank you.

[The prepared statement of Mr. Gioia follows:]

Children's National

Testimony of
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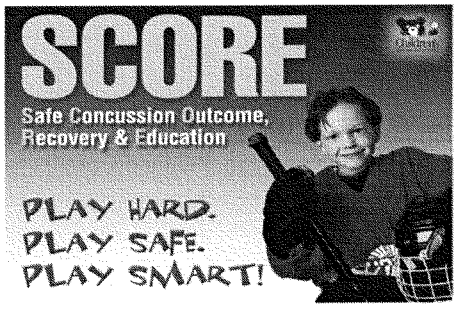
Chair, Policy & Legislation Workgroup
National Council on Youth Sport Safety

Before the
Committee on Energy and Commerce
Subcommittee on Commerce, Manufacturing, and Trade
United States House of Representatives

On

Improving Sports Safety: A Multifaceted Approach

March 13, 2014
2322 Rayburn House Office Building
10:15 am



About Children's National Health System

Children's National Health System, based in Washington, DC, has been serving the nation's children since 1870. Children's National's hospital is Magnet® designated, and is consistently ranked among the top pediatric hospitals by U.S.News & World Report and the Leapfrog Group. Home to the Children's Research Institute and the Sheikh Zayed Institute for Pediatric Surgical Innovation, Children's National is one of the nation's top NIH-funded pediatric institutions. With a community-based pediatric network, eight regional outpatient centers, an ambulatory surgery center, two emergency rooms, an acute care hospital, and collaborations throughout the region, Children's National is recognized for its expertise and innovation in pediatric care and as an advocate for all children.

Children's Safe Concussion Outcome, Recovery & Education Program

Children's National has long been an advocate for child safety and injury prevention. Safe Kids Worldwide, the first national advocacy organization solely dedicated to pediatric injury prevention, was founded by Children's National in 1987. With respect to concussions, Children's Safe Concussion Outcome, Recovery & Education (SCORE) Program is the first and only program in the greater Baltimore-Washington region that specializes in the clinical evaluation and treatment of concussions in children, as well as conducting research and delivering public health education and advocacy nationally and internationally. The SCORE program evaluates and treats children and adolescents with concussions (also known as a mild traumatic brain injury or mTBI). In 2012-2013, the SCORE program at Children's National treated more than 2,000 children in its concussion clinics.

Dr. Gioia is the founder and director of the SCORE Program. He has been a national leader on youth concussion for over a decade. He is an active collaborator with the CDC on their "Heads Up" toolkits as well as a CDC-funded researcher. He is actively involved in national and international organizations addressing better clinical care and research standards for

children and youth with mild TBI including: Steering Committee of the Pediatric Acquired Brain Injury (PABI) Plan; medical advisory boards for the Howard County Public Schools, Maryland State Public Secondary School Athletic Association, and USA Football; and the National Advisory Board of the Positive Coaching Alliance, and a member of the NIH Common Data Elements workgroup. He is the chair of the Policy & Legislation Workgroup on the National Council on Youth Sports Safety, chaired by former US Surgeon General Dr. David Satcher and Dr. Eliot Sorel. He is a member of the concussion workgroups within the National Academy of Neuropsychology, National Athletic Trainers Association, American Academy of Neurology, American Academy of Pediatrics, CDC, NIH, and testified on school outcomes for the 2013 Institute of Medicine report on youth sports concussion. He is the father of three former student-athletes, and a former high school& college football and rugby player.

Introduction to the Issue of Youth Sport Concussion

The child's brain is his most precious resource and the key to a happy, successful future. The primary job of the child is to develop and learn. Sports and recreation provide important developmental opportunities that enrich the lives of our youth by teaching important lessons of teamwork, commitment, discipline, goal-setting, competition, and sacrifice among other things. Physical activity is also known to be critically important to the child's overall health and development. Students that engage in organized sports have been shown to perform better in school. For all of these important reasons, children and adolescents must remain physically active and engaged in organized sports activities. These essential developmental experiences are put at significant risk, whether temporary or long-term, when the child's brain is injured. It is the responsibility of the caretakers of our nation's children and adolescents to maximize their active but safe involvement in sports/recreation activities.

Using our best scientific evidence, we must balance the benefits of sports participation with careful attention to safety issues – especially when the precious resource of the student-

athlete's brain is at stake. In the past decade, significant attention has been directed to the risks associated with concussion by the national and international medical communities, including the international Concussion in Sports Groups' 4 consensus meetings between 2001-2012, 2007 CDC "Heads Up: Brain Injury in Your Practice" guidance, 2013 American Academy of Neurology evidence-based recommendations, 2010 and 2013 clinical reports of the American Academy of Pediatrics, 2012 statement of the National Academy of Neuropsychology, 2014 updated guidelines of the National Athletic Trainers' Association, the 2013 position statement of the American Medical Society of Sports Medicine, and the 2013 report of the Institute of Medicine.

About Concussion/Traumatic Brain Injuries

A concussion involves a strong, violent force applied to the brain that, in most people, changes the brain's electrochemistry (i.e., software); in some people it may alter the brain's structure (i.e., hardware). We know from the work with repeated concussions that if this injury goes undetected or ignored, the risk of long-term cognitive, social, and emotional problems increases. On the other end of the spectrum, it also appears that when concussions are identified early and managed properly, the vast majority of persons recover fully without risk for long-term problems. We also know that the length of time to full recovery can vary from hours to weeks in the vast majority of cases with a small number of persons who take longer to recovery. Early identification of concussion, protection from re-injury, and swift, proper management becomes our central goal.

The incidence of traumatic brain injuries (TBI) occurring to children annually is significant, but the full extent of the problem is as yet unknown. The existing epidemiologic methods are not yet developed to precisely identify the number of concussions as indicated by the recent IOM report. With current figures as likely underestimates, the Centers for Disease Control and Prevention (CDC) studied emergency department visits, hospitalizations and deaths between 2002-2006 and reported 1.7 million people sustain TBI annually, of which 52,000 died,

275,000 were hospitalized, and 1.365 million were treated and released from the Emergency Department.[1] These data do not include, however, concussions diagnosed in primary or specialty care office settings, or concussions that go unreported.

Other data sources tell us that the majority of TBIs (90%) are of a "mild" nature. With respect to sports, Yard & Comstock (2009) indicates an estimated 400,000 sport related concussions reported to athletic trainers at the high school level in five major male sports and four female sports. The true figures, though, are significantly higher as many other sports (e.g., ice hockey, field hockey, lacrosse, equestrian, rugby, cheerleading) were not included in these estimates, nor were non-scholastic high school or younger-age youth sports. In addition, a significantly higher rate of sport related concussion occurs than what is formally reported to the athletic trainer. The recent 2013 Institute of Medicine provides epidemiology figures for youth sports concussions but recognize that our surveillance systems presently are inadequate to inform us of the true incidence of sport-related concussion. Central to the problem of injury identification is the lack of sports medicine professionals at most high school and youth sports practices and games where concussions can occur. As a result, the health and safety of our youth is in the hands of their coaches, parents, teammates, and the sports organizations.

To address the universal need for protection from the risks of concussion in youth and high school sports, all 50 states have now passed youth concussion laws, most of which espouse 3 core principles:

- All coaches be educated about concussion including its signs and symptoms, and its risks and consequences, and parents be informed about the risks of the injury,
- Any athlete suspected of displaying any sign or symptom of concussion must be removed from play,

[1] Blue Book, March 2010 www.cdc.gov/traumaticbraininjury

- and cannot return to sports participation until cleared in writing by a healthcare professional with experience in concussion evaluation and management.

Based on our best medical evidence, the following guidance is provided on the management of concussions in youth:

- No child or adolescent athlete suspected of a concussion should ever return to play on the same day of an injury, regardless of level of athletic performance.
- Injury to the developing brain, especially repeat concussions, may increase the risk of long term effects in children, so there is no return-to-play until completely symptom free.
- Children and adolescents may need a longer period of full rest and then gradual return to normal activities than adults.

Challenges and Solutions to Youth Sports Concussion:

We are posed with a major question and challenge within youth sports: "With concussion awareness at an all-time high, are youth sports teams/ organizations and parents more aware but still not sure what to do?" The simple answer to this question is, yes.

Presently, our greatest challenge is the universal, consistent and effective implementation of our youth sports concussion laws across all youth sports. One problem with our current laws is that only 17 states include non-high school youth sports in their laws. We are leaving out an important segment of the youth sports world as a result.

Maximizing key public health efforts to improve concussion recognition and active response requires a team approach. Coaches, youth sports organizations and parents play a critical and central role in this process and must be the focus of our action-oriented education and training programs. Preparation is the key: What do coaches and parents need to know, and what do they need to do? What tools can assist parents and coaches to do the right thing?

At Children's National Health System, over the past ten years, our SCORE program has delivered hundreds of action-oriented parent and coach concussion education and training

programs using CDC-based Heads Up materials, which I helped to co-author. We have learned much about the community's needs, and how to deliver it. Families and coaches now receive scenario-based training - i.e., a sports situation in which they must recognize and respond to a youth athlete with a suspected injury. We provide them with the essential knowledge and tools such as the free CDC-based Concussion Recognition & Response smartphone app that we developed at Children's National. Our goal is to prepare parents, coaches, youth sports organizations and teams to take responsible action should a suspected concussion occur by walking them through a typical scenario.

There are important examples of good work in taking head-safe, head-smart action such as USA Football's Heads Up Football program where coaches are educated in concussion recognition and response as well as techniques that take the head out of the line of fire. We need to go further with all youth sports. We do not have a coordinated, universal national strategy for educating and training coaches and parents across all youth sports in action-oriented, solution-driven methods to recognize and respond to suspected concussions. We have the tools. We have the programs. We have the awareness. But, we need the implementation mechanism - a more concerted, national effort to effectively infuse action-oriented (not simply awareness-oriented) methods of concussion education and training.

This need is the foundation of the work that several national organizations want to do – for example the newly formed National Council on Youth Sports Safety, the Youth Sports Safety Alliance, and the Sarah Jane Brain Foundation's PABI Plan. In concert with these organizations, and as a member, the Children's National SCORE Program has proposed a National Concussion Resource Center to institute a scalable national plan to make community-based solutions accessible to families and youth sports organizations. We need to build accessible resources in our community that are based on the latest scientific medical information about concussion risk and response.

We must build active partnerships between the youth sports organizations and medical care systems. We have willing teammates across the country such as USA Football, US Lacrosse, USA Hockey, and USA Rugby. We need to add teammates such as the professional sports leagues, sports manufacturing world to support the development of this national system. We are all in this together to build concussion safety measures into the fabric of youth sports, while maximizing participation.

Importantly, science and reason must drive our action-oriented approach to safety in youth sports, maximizing participation and safety efforts together. We must avoid responding to opinion and anxiety in setting the proper course. Key components to a National Resource Center are: action-oriented education and training programs delivered universally, community concussion helplines for families, leagues, schools and medical providers that have immediate questions, guidance after an injury to effective evaluation and treatment programs, and consultation with leagues around program implementation. And because scientific evidence must drive effectiveness, a National Concussion Resource Center needs a programmatic research structure to refine its efforts. We need a quarterback of the team. And we need funding to build the national concussion resource network, disseminating the medically-accepted, scientifically-based tools and methods.

In summary, how can we make youth sports safer? With concussion awareness at an all-time high, we can prepare parents, youth sports teams and organizations and athletes to take positive action through:

1. Action-oriented education and training:

- Parents, coaches, players - learn how to respond to suspected concussions.
- Medical professionals to improve access to quality evaluation & management
- Schools to assist with recovery

2. Prevention measures:

- Re-examine our games through a head-smart lens to reduce contact in general and eliminate unnecessary contact.
- Re-examine the games' rules and enforce those that protect the head and modify behavior in head-smart ways.

3. Continually apply our best medical science and monitor definitive research.

Concussions are serious injuries to the brain that threaten the development of our youth. But, we do not need to be scared away and avoid the developmentally-critical participation of our nation's children in sports activities. Instead, we can take confident control of the youth sports concussion program by instituting practical, action-oriented education and training to recognize and respond, and to prevent injuries to the extent possible. To do so, we need a coordinated medically-driven, scientifically sound national plan of action at the local community level, leveraging the many interested partners toward our common goal of maximum, safe sports participation for our youth.

Summary of Main Points

Sports and recreation provide important developmental opportunities that enrich the lives of our youth by teaching important life lessons. We must balance the benefits of sports participation with careful attention to safety issues. Science and reason must drive our action-oriented approach.

In youth sports, the health and safety is largely in the hands of coaches, parents, teammates, and the sports organizations. They need medical guidance, however, in early identification of concussion, protection from re-injury, and swift, proper management.

Coaches, youth sports organizations and parents must be the focus of action-oriented education and training programs. Awareness is not enough. Their preparation to act is the key.

Over ten years, the SCORE program at Children's National has learned about the needs of families and coaches, assisting in the development of the CDC Heads Up programs, and providing community scenario-based training – i.e., a sports injury situation focused on teaching how to respond to a suspected injury.

Our country needs a more universal mechanism to implement national, community-focused youth concussion solutions - a concerted, national effort to effectively infuse action-oriented - not simply awareness-oriented - methods of concussion education and training.

Our Children's National SCORE Program has proposed a multidimensional National Resource Center to address this need using our expertise and experience. Several national health organizations and youth sports governing bodies are focused on this issue; we have willing partners across the country.

We can take confident control of the youth sports concussion program by delivering medically-guided, scientifically sound, accessible youth concussion resources to our local communities. We must leverage the interest of many national partners toward our common goal of maximum, safe sports participation for our youth.

Mr. TERRY. Very good. Dr. Shenton, you are now recognized for your 5 minutes.

STATEMENT OF MARTHA E. SHENTON

Ms. SHENTON. Thank you. I want to thank Chairman Terry, Ranking Member Schakowsky, and members of the subcommittee. I am honored to be here today.

My focus is going to be on radiological evidence of both concussion and subconcussive blows to the head. And if I could have the next slide.

What is known is that mild traumatic brain injury is common in sports injury, and when we are talking about a single mild TBI, about 80 percent get better, between 15 and 30 percent go on to have persistent concussive symptoms, as have been described today.

What is most concerning though are what has been called chronic traumatic encephalopathy and other neurodegenerative disorders, and that is the second one where it is repetitive mild traumatic brain injury that we are really concerned with. And the clearest evidence comes from postmortem studies.

If I could have the next slide? Here is a postmortem slide. This is Ann McKee's work that shows how protein in the brain, and those are the brown areas that show up. And this is in a case of a retired professional football player who had symptoms, and was presumed to have chronic traumatic encephalopathy, which was confirmed at postmortem.

Next slide, please. Now, here are four individuals, A, B, C, and D. What is interesting here, and this is work by Goldstein, it shows that blast injury and repetitive brain trauma look the same at postmortem. So we have a military person at 45 with one close-range blast injury, a 34-year-old with two blast injuries, an amateur football player at the age of 18 with repetitive concussions, and then a 21-year-old with subconcussive blows to the head only.

Next slide please. So what is known? We have gone over the first two. The third is mild TBI is very difficult to diagnose, and that has been a really serious problem because if you use conventional CT and conventional MRI, you are not likely to find differences or abnormalities in the brain, and so many people have said there is no problem then. The problem is the correct advanced tools have not been used until more recently. And now with advanced neuroimaging, we are able to both diagnose and move towards prognosis and hopefully intervention. Advanced neuroimaging techniques such as diffusion imaging, which we have been using in our laboratory, show radiological evidence of brain alterations in living individuals with mild TBI. And so if we can detect this early, and we can perhaps then look at underlying mechanisms and characterize what is going on in order to come up with preventative measures.

Next slide, please. So this is a study from our group, looking at hockey players from university hockey players in Canada. And the bottom line is over on the right. The first is at preseason and the second is at postseason. The red dots are three individuals who had concussion during play, from preseason to postseason. And the in-

crease is increase in extra cellular water in the brain, which is not a good sign.

Next slide, please. We also looked at brain matter, looking at cortical thinning in the brain, and that is the cortex where neurons are in the brain. And this is a study in former professional football players who were symptomatic when we looked at them. And what we found was that there is cortical thinning compared to age-matched normal controls. What is most concerning, however, is that blue line that shows that the cortical thinning accelerates with age, whereas the red line, our control group, where it is almost completely flat. And this suggests that cortical thinning may indicate abnormal aging and a risk for dementia that we can see right now in living individuals.

Next slide, please. Now, this is a study that we did in Germany with elite soccer players, and we selected them specifically for not having a history of concussion, and not having any symptoms whatsoever. And what we found was, compared to professional swimmers, there was a huge difference between the two groups, with the controls on the left and the soccer players on the right. Almost a complete separation between the two groups, with an increase in what is called radial diffusivity, which is a measure of damage to myelin in the brain.

Next slide please. So what we don't know: Why do concussive and subconcussive trauma result in some and not in others? Another question we don't know is, Why do some develop neurodegenerative disease while others do not? What are the predisposing factors? Is exposure or genetics involved, because not every football player, not every soccer player, not every hockey player who plays and gets hit to the head ends up with these neurodegenerative diseases, which is what, I think, people are most concerned with.

And next slide. So what we need is diagnosis to detect brain injury early. We have imaging tools now that are sensitive, widely available, and can be applied in vivo, prognosis to follow recovery and degenerative processes. So we need to follow recovery and degenerative processes in order to predict who will have a poor outcome, and who will have a good outcome. And knowing that, we might be able to intercede with treatment to halt the possible cascade of neurodegenerative changes.

And finally, just in summary, next slide. Sports concussion leads to alterations of the brain's white and gray matter. Advanced neuroimaging is sensitive to detect brain alterations following concussion and subconcussive brain trauma, and the impact over time is important. We need longitudinal studies to identify different stages of recover, and being able to pick out ahead of time what is going to lead to a poor outcome so that we can intercede.

And finally, some measures of safety, such as rules for returning to play are needed following observable evidence of brain trauma.

Thank you.

[The prepared statement of Ms. Shenton follows:] [1]

[1] Additional information has been retained in committee files and also is available at *http://docs.house.gov/meetings/IF/IF17/20140313/101897/HHRG-113-IF17-Wstate-ShentonM-20140313-SD001.pdf.*

Testimony of Martha E. Shenton

Professor of Psychiatry and Radiology

Brigham and Women's Hospital Harvard Medical School

and VA Boston Healthcare System

Before the

United States House of Representatives

House Energy and Commerce Committee

Subcommittee on Commerce, Manufacturing, and Trade

At a Hearing entitled

"Improving Sports Safety: A Multifaceted Approach"

Rayburn House Office Building, Washington, D.C.

March 13, 2014

Chairman Terry, Ranking Member Schakowsky, and Members of the Subcommittee, I am honored to have this opportunity to appear before you today.

My remarks focus on the radiological research on sports-related concussion and subconcussion. I specifically address the evidence resulting from the use of advanced neuroimaging techniques, particularly diffusion magnetic resonance imaging (dMRI) which, unlike conventional magnetic resonance imaging (MRI) and computed tomography (CT), is sensitive to diffuse axonal injury, the most common injury observed in mild traumatic brain injury (mTBI) (e.g., see review in Niogi and Mukherjee, 2012; Shenton et al., 2012, included in supporting documentation).

Executive Summary: The following will be reviewed:

1) The magnitude of mTBI as a health problem in this country, what we know about mTBI, and why it has been difficult until quite recently to find radiological evidence.

2) Evidence from post-mortem findings of CTE from previously retired professional football players from Ann McKee and colleagues' work (McKee et al., 2009; 2013).

3) Evidence of the effects of repetitive brain trauma from blast injury, which looks quite similar to the CTE findings in athletes (Goldstein et al., 2012).

4) The importance of repetitive mTBI, particularly in sports-related injuries and how repetitive injuries may increase the risk of neurodegenerative disorders, once referred to as "punch drunk" or "dementia pugilistica" in boxers, and now referred to as chronic traumatic encephalopathy (CTE).

5) Evidence from our group, using diffusion MRI, that shows brain alterations in university hockey players in Canada from pre- to post-season, including three subjects who experienced a concussion during the season (Koerte et al., 2012a, included in supporting documentation), followed by a comparison of symptomatic retired professional football players and matched controls that demonstrates cortical thinning and accelerated thinning with age in retired, symptomatic professional football players compared with controls (Koerte et al., unpublished data).

Finally, evidence from our group of brain alterations, from a study of elite soccer players from Germany who were selected for having no symptoms and no history of concussion, and had only experienced subconcussive blows to the head (Koerte et al., 2012b, included in supporting documentation).

This evidence, taken together, suggests that there are some individuals who are at increased risk for brain changes that may lead to neurodegenerative disorders such as, but not likely limited to, CTE.

The question to be addressed is why some individuals develop long-term consequences of brain trauma while others do not.

First, sports-related mTBI, also known as concussion, affects between 1.6 million and 3.8 athletes in the United States each year (Langlois, Rutland-Brown, and Wald 2006). The number of sports-related concussions in youth has also increased in recent years (Gilchrist et al., 2011). Moreover, the incidence of repetitive subconcussive blows (i.e., hits to the head with enough force to have an impact on neuronal integrity, but without associated symptoms) is even greater. For example, a recent study by Broglio et al. (2011) found that the average high school football player receives 652 hits to the head per season that exceed 15 g's of force. Further, a recent study from our group (Koerte et al., 2012b; included in supporting documentation) describes structural changes to white matter in soccer players with extensive histories of heading the ball but *without* known symptoms or history of concussions, i.e., only subconcussive blows to the head.

The number of mTBI and sports-related mTBI reported each year in the United States is, however, likely a gross underestimate since it does not include those who seek treatment in private clinics, those seen by primary care physicians, or those who do not seek treatment at all. For this reason, and based on the large number of unknown cases, mTBI has been called a "silent epidemic" (Goldstein, 1990).

Fortunately, for the most part the news is positive in that most who suffer from a single mTBI recover within days to weeks. For a minority of those afflicted (15-30%), however, persistent post-concussive symptoms continue for months and even years (e.g., Bigler 2008; see also reviews in Shenton et al., 2012; Levin and Robertson 2013), with some going on to permanent disability, and 20% not returning to work (Nolin et al., 2006). This "miserable minority" (Ruff et al., 1996) often evinces persistent post-concussive symptoms that include dizziness, headache, irritability, sleep disturbances, depression, impulse control problems, and deficits in attention, concentration, memory, executive function, and speed of processing (e.g., Bigler 2008).

Because conventional CT and MRI do not generally show brain injury in mTBI, and because the symptoms are non-specific (i.e., they are also observed in depression and post-traumatic stress disorder, as well as other disorders), it is has been a challenge to diagnose mTBI. There are, in fact, some who believe that if you remove the effects of depression and PTSD, mTBI does not exist, or the origin may be psychological in nature. I do not share this belief.

Radiological evidence has been slow in coming, but with more sophisticated imaging techniques such as diffusion MRI, more recent radiological evidence has shown subtle brain alterations in mTBI that has not heretofore been detectable. This work is, as noted above, more recent, with the first studies beginning in only 2003 (see review in Shenton et al., 2012). Understanding the mechanisms that determine a good versus a poor outcome, however, remains to be determined, and is an important area of scientific inquiry.

Second, there is evidence that those who experience repetitive brain trauma over a period of time may be at risk for developing

chronic traumatic encephalopathy (CTE). This condition is most commonly observed in athletes who experience repetitive symptomatic concussive or asymptomatic subconcussive trauma, such as boxers, football players, or hockey players. The term first used to describe the long-term consequences of repetitive head trauma was dementia pugilistica or "Punch Drunk," in reference to boxers who experienced cognitive impairments and changes in mood, motor problems, impulsivity, and other impairments (Martland, 1928; Millspaugh 1937; Corsellis, Bruton, and Freeman-Browne 1973). This term, along with the term CTE, describes a neurodegenerative disease believed to be caused, at least in part, from repetitive brain trauma, including repetitive mild traumatic brain injuries (mTBI).

CTE has, nonetheless, also been observed in service members returning from Iraq and Afghanistan (Goldstein et al., 2013), where between 2000 and 2012, 253,330 service members had sustained at least one mTBI (DoD Worldwide numbers for TBI, 2011). The frequency of these injuries has led to TBI being called the "signature injury" of war (Okie et al., 2005). Of further note, as of June 30, 2012

(2000 to 2012), over 266,810 service members were screened for sustaining at least one concussion (Defense and Veterans Brain Injury Center, 2012, at www.dvbic.org/dod-worldwide-numbers-tbi). A most disturbing possible consequence of these "invisible" injuries is the increased rate of suicide among veterans. More than 1,100 veterans took their lives between 2005 and 2009 (DOD Worldwide Numbers for TBI, 2011), more lives than were lost from combat during this same time period.

Third, the estimated cost of mTBI is enormous to the person, to his/her family, and to the larger community, with overall healthcare costs estimated to be $60 billion per year for TBI in general (Finkelstein et al., 2006) and $17 billion for mTBI (CDC, 2003).

Fourth, and in summary, it is only recently that radiological evidence has been available to detect brain alterations in mTBI, including in athletes playing football, hockey, and soccer. Post-mortem evidence of repetitive brain trauma in former professional football players shows clear changes in the build up of tau proteins in the brain

(e.g., McKee et al., 2009; 2013). However, before even considering such long-term effects it is important to be aware of the brain alterations observed in *living* players who do not show clinical or cognitive symptoms, nor even have a history of concussion, but nonetheless evince brain alterations as was observed in the Koerte et al. (2012) study of soccer players with only subconcussive blows to the head. Might some of these individuals progress to neurodegenerative diseases such as CTE? We don't know the answer here. But, if we can detect subtle changes early, and we can follow the impact of concussion over time using imaging, we might be able to predict what kind of changes lead to recovery, and what kind of changes lead to persistent post-concussive symptoms, and perhaps to a further cascade of changes in the brain, ultimately leading to major changes in personality, mood, and cognition as observed in CTE. Further, if we can detect changes sufficiently early, then can we find interventions that will prevent progression to CTE and other neurodegenerative diseases?

Early detection of changes to the brain could help us address other questions as well. For example, why do some athletes develop a neurodegenerative disease while others do not? What are the predisposing factors? Exposure? Genetics? How can we facilitate brain recovery? If, initially, mTBI has a neuroinflammatory response, would anti-inflammatory medications assist in recovery? What supports and what hinders regeneration and recovery? These are all questions that need to be answered. What we do know is that diagnosis is critical for mTBI, and it is now more possible to reach a diagnosis in a clinical setting when techniques such as diffusion imaging are used.

Imaging tools must be sensitive and applicable to living individuals. And once they are widely available, we will be able to follow recovery and degenerative processes in a manner that gives us more information about prognosis. With accurate diagnoses that detect individually specific brain regions that are affected, treatment can then be developed to intervene prior to the possible cascade of degenerative changes.

In conclusion I believe that the subcommittee's focus on sports safety, and in particular sports-related brain injury, is warranted. Safety in high-impact sports *should* be a major focus of attention, as there is clear evidence of changes to brain where there is increased risk of head trauma. Policies, such as return to play restrictions, which govern what happens following an injury with observable evidence of brain trauma, should be highly protective of brain health. And individuals crafting such policies should keep in mind just how much we are learning right now about sports related brain injuries – and how much more we are likely to learn in the years to come.

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Mr. TERRY. Thank you. Very impressive testimony from everyone, and I was even impressed that you all stuck to the 5 minutes, pretty close.

Now, I am going to go back to Dr. Molfese because I think your testimony and Dr. Shenton's kind of juxtapose each other here very nicely.

So part of what your research is doing is finding that baseline of the new athletes that enter University of Nebraska. So is this allowing you to detect the injuries earlier, that there may have been some pre-existing subconcussion? How are you identifying that, what is it telling you, and what is the university doing to implement some level of protections?

Mr. MOLFESE. Well, one of the major changes we have seen, and I think this is occurring across the field now, is the effort to get pre-concussion data. So basically, more and more schools are moving to assess student athletes prior to the start of the season, and that certainly is what we are doing. And then should a player be injured, and they are identified through trainers or the medical team. One of the weaknesses here is that the players do not always self-identify, and so we have run across that a number of times in our testing, or we will pick up something on our test the trainers and the medical team didn't know about simply because the player didn't disclose. And then we also try to test somebody else who plays a similar position but has not been injured, and they act sort of as a game control over the course of a season. And generally, what we are finding is both effects that occur across the season and just our normal players who have no history of concussion being identified, their brain speed of processing does change over the 4 to 5 months of training and the season, but then with the players who are—who do experience a concussion, we see, in terms of brain electrical activity, again, the slowdown of about 200 milliseconds. That is four times faster than the slowdown you see in Multiple Sclerosis, for an example, for a contrast. So clearly, the brain has changed the way it is processing.

We are just now moving to start intervention programs with the players that we identify. There is some data out there with early Alzheimer's that suggest working memory-type tasks may take even a week of intervention, shows a 4-to-5-week continual gain in improvement, and so we are trying to see if we can see some of that occurring.

Mr. TERRY. Thank you.

Dr. Gay, in regard to concussions, though many times it is not a direct blow, but coup contra coup, it is being hit so that the head is going back and forth, and the brain is sloshing around.

You mentioned going back to 1970s type of equipment, and Tom Osborne likes to talk about the neck roll. Describe to me what you mean by 1970s equipment, and how it may actually reduce concussions.

Mr. GAY. Thank you, Mr. Chairman.

Yes, the neck roll, what I call a horse collar, is really a piece of equipment that has disappeared from the game. And it does an important thing, it essentially immobilizes the head. So if concussions are incurred by the rattling of the brain back and forth, especially from a blow to the side, the horse collar will substantially damp

that down. To my knowledge, there are no epidemiological studies of that being effective, but my personal opinion, even though I am largely ignorant of medical science, is that if you immobilize the head, that is going to solve a lot of the problems, especially with these rotational hits. Yes.

Mr. TERRY. Dr. Graham, does that make sense?

Mr. GRAHAM. I think whether or not the horse collar would have that effect, I don't know, and, of course, our committee was based purely on science and, you know, reviewing the literature, but I think the principle is, you want to find ways to minimize the linear and rotational forces that come into effect with a blow to the head, and whether you can do that by equipment, whether you can do that by change in play, you know, that is what you have to do to decrease the incidence of concussion.

Mr. TERRY. Thank you. I only have 11 seconds left, so I will yield back and recognize the Ranking Member, Ms. Schakowsky.

Ms. SCHAKOWSKY. You know, in addition to the science, so much talk has been about culture, and it seems to me that that is very important. So a change in the culture means not only managing head injuries when they occur, but also encouraging safer play to reduce the risk of head injuries.

So, Mr. Heaton, you spoke about the need to change the, I am quoting from your testimony, "the win at all cost" attitude among players and coaches. What would you tell teams to help them change that attitude, both within themselves and teammates, and perhaps more challenging, in coaches?

Mr. HEATON. Thank you. Well, frankly, I would actually encourage the coaches to stress this as much as possible, as well as the parents, because the coaches and the parents are there to help us learn how to play these sports correctly, and if they can emphasize not having to worry about winning to the point where you get hurt, then it will trickle down to the players, and then the players become coaches, and then it is this never-ending cycle of teaching and making sure that the players know that winning is not the most important thing. You know, it feels great to win, but I would much rather lose than have another concussion.

Ms. SCHAKOWSKY. Clearly, you were aware because of the severe consequences of the brain injury, but do you think that youth athletes understand what those symptoms are?

Mr. HEATON. Yes. I think it is getting better, indeed, especially in my school. I mean we emphasize making sure that you know the symptoms of concussions, and I feel like it is spreading as well, but I——

Ms. SCHAKOWSKY. Let me ask Dr. Gioia that, too.

Mr. HEATON. OK.

Mr. GIOIA. Yes, certainly, at this point, the education programs are also being directed toward the athletes, and quite honestly, about 5 years ago, maybe 6 years ago, there was a study that showed that that was the number 1 reason why athletes were not coming out of the game, because they didn't know how to tie together the symptomatology. It wasn't simply that they didn't want to lose playing time, but they didn't know what they were dealing with in themselves.

Ms. SCHAKOWSKY. Right.

Mr. GIOIA. But we also believe that athletes and teammates need to watch out for each other, because the concussed athlete themselves may not have the wherewithal to know that they aren't right, and yet their teammate right next to them oftentimes does. So there is a responsibility within that team to take care of each other, and that is an important focus.

Ms. SCHAKOWSKY. And that goes to culture as well.

Mr. GIOIA. Yes, absolutely.

Ms. SCHAKOWSKY. Yes. Yes.

Dr. Shenton, please explain a little bit how advanced neuroimaging works, and describe the types of changes in the brain your lab is able to detect that traditional imaging can't, and also some of the types of neuroimaging used by your lab have been a significant part of the research on diseases like Alzheimer's and schizophrenia. Why are the same imaging techniques appropriate for research on these diseases and research on sports-related brain injuries?

Ms. SHENTON. OK, I have a slide, which is just at the end of my slides, that just explains in one slide diffusion imaging, which I think would help out here.

Ms. SCHAKOWSKY. The one slide I really didn't understand was comparing swimmers with——

Ms. SHENTON. With soccer players——

Ms. SCHAKOWSKY. Right.

Ms. SHENTON [continuing]. But I was going to go through——

Ms. SCHAKOWSKY. All right, go ahead.

Ms. SHENTON [continuing]. And just show you——

Ms. SCHAKOWSKY. OK.

Ms. SHENTON [continuing]. Why diffuse external injury is important because the injury that happens in the impact to the brain is generally a stretching of the cables in the brain, which is really the white matter, and for example, the corpus callosum is the largest white matter track in the brain, and so you get sharing. And this doesn't show up on tradition CT or MRI. In fact, the first mild TBI conference I went to, no one showed a brain. And I looked to my colleague and I said why would no one show a brain. And he said because everyone knows that you can't see anything on the brain. And I said, but then nobody is using the right tools here.

And this is just a very simple principles of diffusion imaging. If you look on the left, this is ink that goes on a Kleenex. It goes in all directions, and that is called isotropic diffusion. If you look on the right, it says anisotropic diffusion. So you are dropping ink on newspaper, and newspaper has fibers so it restricts the water. And this is the same principle that is used quantitatively to look at the brain, so that, if you are in CSF, it is very round, and it is isotropic, everything goes in the same direction. If you are looking at white matter, you are restricted in 2 directions, and so you can measure what the integrity is of white matter fiber bundles in the brain. And that is what you need to look at in mild TBI.

Now, if you have someone come in with a moderate or severe brain injury, you don't need this kind of technology.

Ms. SCHAKOWSKY. Uh-huh.

Ms. SHENTON. They are going to just be put into neurosurgery, and they are going to do an operation. It is these very subtle brain

injuries that aren't recognized using conventional imaging, where you can recognize it if you use something like diffusion imaging. And we have shown over and over again now that you can see—and it is not just our group. Starting in 2003, people started using diffusion imaging because it is the most sensitive imaging tool that exists today to look at diffuse external injury, which is the major injury in mild TBI.

So what needs to be done now is to look at acute injury, and see what predicts outcome, like do acute injury at 72 hours, at 3 months, at 6 months. Can we then predict, knowing that what happens at 72 hours, if we have someone in our lab that is trying to separate water that is outside cells versus in cells. If you can predict from 72 hours, then you can go back and say, OK, maybe we want to put in anti-inflammatory medications if this is a neuroinflammatory response.

We don't know enough right now. The only way to know is to do these longitudinal studies, and follow over time using very sophisticated imaging technology, in my opinion. Once you know, you can diagnose. Once you diagnose, you——

Ms. SCHAKOWSKY. So this could be very promising——

Ms. SHENTON. Yes.

Ms. SCHAKOWSKY [continuing]. Not only for our athletes, but our returning veterans and——

Ms. SHENTON. Yes.

Ms. SCHAKOWSKY [continuing]. Applied eventually to schizophrenia or Alzheimer's?

Ms. SHENTON. Well, actually, we have applied—I am primarily schizophrenia research, that is——

Ms. SCHAKOWSKY. OK.

Ms. SHENTON [continuing]. What I have done for 30 years before I became a TBI researcher in 2008. And we have a measure called free water, this kind of imaging that shows that early on at the very first episode of schizophrenia, you see fluid around all of the brain that is free water, it is isotropic, but in just the frontal lobe, you see it more restricted to inside tissue. And this is a brand new technique that was developed by a Fulbright Scholar that is in our lab from Israel. And so——

Ms. SCHAKOWSKY. OK, I am going to have——

Ms. SHENTON. OK.

Ms. SCHAKOWSKY [continuing]. To say thank you——

Ms. SHENTON. Fair enough.

Ms. SCHAKOWSKY [continuing]. Because it is very promising.

Mr. TERRY. Two and a half.

Ms. SCHAKOWSKY. Thank you.

Mr. TERRY. Yes, thank you.

Gentleman from New Jersey is recognized.

Mr. LANCE. Thank you, Mr. Chairman.

Dr. Johnston, you stated that many sports-related concussions still go undiagnosed, and I would like to know why, in your opinion, that is the case, and how can we improve that in our State laws, and also the involvement of coaches and players and PTAs, areas where we need to have improvement?

Mr. JOHNSTON. Thank you for the question.

I think I would echo what has been said by others on the panel. It is on. It is on. Sorry. I would echo what has been said by others on the panel, that I think that a lot of it has to do with recognition. Obviously, people are very good at recognizing when someone gets knocked out on the field, but, of course, that is a very small percentage of all concussions, and I think that as our understanding of all the various symptoms that can go with concussion have arisen, it becomes incumbent upon us to improve the quality of the education that we give to our coaches, players, trainers, officials, about the symptoms of concussion. I think that that is the main reason. My sense is that, in general, the culture, at least speaking for the State of Alabama, that all the coaches that I have come into contact are believers, they are not, you know, purposefully hiding, you know, kids and putting them back in knowing they have concussions, but I think that sometimes it is hard to recognize, especially when young athletes don't tell you how they are feeling, and other issues which I guess were brought up with the importance of teammates being involved with diagnosing these players so they can be pulled and appropriately evaluated.

Mr. LANCE. How close, in your opinion, are we to a better design for helmets?

Mr. JOHNSTON. I think that we are at the very beginning. I think that we have been using a standard that has not changed for 40 years, that was designed for skull fractures——

Mr. LANCE. Yes.

Mr. JOHNSTON [continuing]. That has served its purpose, and I think that many investigators around are working to improve the quality of the standards to include linear and rotational acceleration, as well as other important aspects of impacts. And just like the automotive industry did 30 years ago with, once you start ranking cars with safety ratings, the market can be relied upon for manufacturers to improve their helmet designs to improve their sales. So I think that is the stage we are at. I think standards are an important part of the equation.

Mr. LANCE. Thank you.

Dr. Gay, in your testimony, you have discussed the fact that there is a numerical rating system for a helmet's impact, I think it is designed at Virginia Tech, the Star System, and you have called it the best tool we have for analyzing the merits of various helmet systems.

Can you briefly explain how the numerical scoring system works?

Mr. GAY. Yes, thank you, Mr. Vice Chairman.

Basically, it involves a test where you drop the helmet from a given height, a varying height, to the side, to the front, to the back. It tries to simulate the kinds of impacts that a football player would actually experience, and numerical scores are given to the maximum acceleration that the NOCSAE head inside the helmet feels for these given drops, based on a, in my opinion, fairly crude initial model of what causes concussions. There is no effect to take into account rotation, there is no effect of temperature, and, in my opinion, the reproducibility is not as good as one would like, having tried to do examples of these kinds of tests in groups that I have been involved with.

So I think it is a good first start. It is the best we have right now. I think it needs to be paid attention to, but there is a lot of room, a lot of room for improvement.

Mr. LANCE. Thank you, Dr. Gay.

And finally, Ian. How old are you and what grade are you in?

Mr. HEATON. I am 18 and I am a senior.

Mr. LANCE. And does that mean you will be going off to college in the autumn?

Mr. HEATON. Yes——

Mr. LANCE. And——

Mr. HEATON [continuing]. I will.

Mr. LANCE. And do you know yet where you will be attending college?

Mr. HEATON. I am going to Elon University in North Carolina.

Mr. LANCE. In North Carolina. My congratulations to you, and my condolences to your parents on the cost of higher education in this country. It is a great school. I have a goddaughter who is a freshman there. That means she is a little older than you, but I will be happy to introduce you to her.

And let me say, I am very proud of your testimony, and I could not have done what you have just done when I was 17 or 18, and certainly, I think the Nation has benefitted by your outstanding testimony.

Mr. HEATON. Thank you.

Mr. LANCE. Thank you.

Mr. TERRY. Gentleman from Mississippi, you are now recognized for 5 minutes.

Mr. HARPER. Thank you, Mr. Chairman. And thank each of you for being here and sharing your expertise on what is a topic that we are really just learning about, as it has been in the news for several years, but it is, I think coming to the forefront. And your work and your information, your testimony on the record here today I think will be beneficial to us.

As a parent of a 24-year-old young man with Fragile X Syndrome, I particularly appreciate the work that you do at the Children's Hospital, you, Dr. Gioia, you, Dr. Johnston, but in preparation for this, I had some discussion with some parents back home, and the interesting discussion is I had several friends who have daughters playing youth soccer, and a number of them reported an increase in the number of concussions suffered by young ladies playing youth soccer. You know, we seem in the news to always associate it with NFL, and helmet-to-helmet contact, and concussions and things that we see on the field of play, but it appears in everything we do in life, every sporting event, there is that danger and that risk. That is why, I think, what you are doing with the Think First Alabama, Dr. Johnston, the preventive part of it is how do we educate our players and coaches, parents, and perhaps, using the teammate approach, the safest thing may be to have the backup position player be the one to report for the first teamer when they need to come out, you know, that might get them off the field. But thank each of you for your work.

And, Dr. Johnston, educate just a little bit on what is a subconcussive impact? What does that mean, and how important is

that when addressing concussion diagnoses, and should subconcussive impacts affect rules of game and play, and if so, how?

Mr. JOHNSTON. Yes, so I think that the definition of a subconcussive impact would be all those other, the 99.9 percent of impacts that happen that don't result in a concussion, meaning a diagnosed concussion. And as has been pointed out previously, the rub with concussion is the diagnosis part. If you look at some of our historical studies about rates of concussion in different sports, it is very variable, and a lot of that has to do with who is diagnosing it and, you know the, you know, males versus females, whether or not men are more likely to report or less likely to report symptoms. But I think that a subconcussive impact is all those other impacts that we have found more and more information with the important imaging that has been done in Boston and other places, that even these subconcussive impacts have results in terms of anatomic, you now, structural changes in the brain over time.

So I think that the subconcussive impact needs to be addressed in terms of lessening the overall cumulative impact load that every player has. Football is kind of the most obvious thing——

Mr. HARPER. Right.

Mr. JOHNSTON [continuing]. In terms of player practices and how many practices a week children should be able to do hitting and whatnot, but I think that has applications for all sports.

Mr. HARPER. OK, thank you.

And, Dr. Molfese, if I could ask you a question. Just for clarification first, if I could ask, the 77 percent of military that——

Mr. MOLFESE. Yes.

Mr. HARPER [continuing]. That figure, is that how many of TBI cases have suffered concussions, or is that 77 percent of all military? I wasn't quite——

Mr. MOLFESE. That is of traumatic brain injuries——

Mr. HARPER. OK.

Mr. MOLFESE [continuing]. Seventy-five to 77 percent are concussions, mild TBIs.

Mr. HARPER. I gotcha, OK. And can you tell us more about the sideline imaging work that you are doing? You know, is this practical, is this something that we can expect to see rolled out to sidelines across America to diagnose our athletes, and perhaps how about onto battlefields to diagnose our warriors?

Mr. MOLFESE. I think it is very possible. We have actually already published a paper just this last year in 2013, where we took one of our EEG systems and recorded on the sideline of a field. The biggest challenge for us in making it practical is to get the processing time down. At this point, it takes us an hour. If we can get it down to 5 minutes, then I think we can sell it to the coaches, because they are the ones really that are going to determine.

And I guess at this point, given all the other issues, the common tests we use right now are like the SCSI 3 and the impact, which are some neuropsych assessment tools, sort of questions to the player, and they have to reflect and they may be a little foggy because of the concussion, but these tests don't have any predictability or reliability after 2 days post-injury. That is our big problem. It doesn't predict recovery time, it doesn't predict the severity of the injury, and so on. So these biomarkers that we all are talk-

ing about are really the critical things that we are hoping are going to be much more reliable, more predictive.

Mr. HARPER. Thank you very much. And thank each of you for being here.

And I yield back.

Mr. TERRY. Thank you. And, generally, this would end, but we all have so many questions, we are actually going to do a second round, and plus the bells aren't going to go off for at least another 7 minutes. Jan does have a conflict, and she has given us approval that she is going to leave, but she trusts us to ask legitimate questions.

Ms. SCHAKOWSKY. But let me just really thank this panel, the previous panel as well, but the intensity now of the scientific research and then its application to the playing field, and actually so many other fields, I really want to thank you for telling us what is going on. And I also did want to thank Ian Heaton for coming here today. I think it is important to have people like Briana and Ian to tell their stories, and give us a face to the importance of this. I want to thank the FTC too for making sure that false claims aren't made, but this is so important, so appreciated, and then we will have to figure out where it leads us, but it certainly has informed us. Thank you.

Mr. TERRY. Yes. I would agree with every word of that.

So this is a question to you, Dr. Molfese, and Dr. Shenton, and it dovetails into what the gentleman from Mississippi was talking about as well, but are the symptoms of a concussion or TBI uniform enough so that it is possible for early detection or developing a checklist for a coach or a parent to be used, you know, by nonmedical? We will start with you, Dr. Shenton.

Ms. SHENTON. No. The symptoms——

Mr. TERRY. Well, that was easy.

Ms. SHENTON. The symptoms overlap with depression and PTSD, and that has been a real problem. In fact, there was a paper published in The New England Journal of Medicine that said when you remove the effects of depression, and you remove the effects of PTSD, mild TBI doesn't exist. And that is a real disservice, and it used to be that people would claim that when people came in complaining that they still had symptoms from hitting their head, since there was no evidence from conventional MRI or conventional CT, they said go see a psychiatrist. So it was really not appropriate at all, because there is at least a small minority of people who have mild concussion who go on to have symptoms, and they can go on for months, for years, and then they can clear up. So that is separate even from CTE.

What you need is radiological evidence for diagnosis, the same way you would want to know values of a blood test for cholesterol or a broken leg. And I think we are moving in that direction, and that is what we need is the hard evidence——

Mr. TERRY. OK.

Ms. SHENTON [continuing]. Because the symptoms are too nonspecific.

Mr. TERRY. All right. Dr. Molfese?

Mr. MOLFESE. There are actually studies published looking at the number of symptoms, and a wide variety of a number of symptoms

people will report. There is no data that indicates whether somebody reports lots of symptoms versus a few symptoms, that that has any relation to how long they are going to recover, how serious the injury is, how great the impairment is——

Mr. TERRY. Right.

Mr. MOLFESE [continuing]. Unfortunately.

Mr. TERRY. So can we get to the point where the seventh grader takes a big hit, that there is a checklist, per se, that the coach could use to determine if that kid should go back into the game?

Mr. MOLFESE. Well, I think in general, there certainly are guidelines out by the CDC and others that list concussion symptoms. And so I think the general bias at this point is if the individual reports any of these symptoms, that they should be pulled, because we do know that there is data to indicate that if you do have a concussion and then you start playing again before the symptoms resolve, the likelihood of even death is much greater.

Ms. SHENTON. Um-hum.

Mr. TERRY. All right.

Mr. MOLFESE. Not to mention further significant concussion that is going to take longer to recover.

Mr. TERRY. All right. So this one is for Dr. Johnston and Dr. Gioia.

One of the debates that is occurring in the State of Nebraska right now is you have a child, all right, a high school student that suffers a concussion during a game. So it has been diagnosed. What do you do next? Right now, the thought is you keep him home or her home, dark, no electronics. That is kind of the norm. There is a discussion whether that is appropriate or not, or to what length.

What do you know? What would you recommend?

Mr. JOHNSTON. Well, I will tell you about how we handle things in Alabama, and I think a lot of what we do is based on the CDC Guidelines and the Zurich Guidelines, which is that once an athlete is diagnosed, they are removed from the field of play, and then they are evaluated. We use the SCAT, which is the sports concussion assessment tool, which is a sideline-based assessment. We also use it afterwards as well. It has kind of a quick mini inventory of neurological exam and neurocognitive function. And then when children have symptoms that persist, you know, obviously, they don't return to any sort of play or even an escalation of activity until their symptoms have completely resolved. And then those children who have persistent symptoms lasting beyond the 1 to 2 weeks are then referred to neuropsychologists, like Dr. Gioia, and a traumatic brain injury program.

So I guess I would defer to you for——

Mr. TERRY. What would you recommend——

Mr. GIOIA. Yes.

Mr. TERRY [continuing]. Dr. Gioia?

Mr. GIOIA. Yes. This is a big question at this point. This really comes to what is the best treatment for this injury. And let me just say, the field is moving on this one, and the recommendations that we make, and I have written several recent papers on this, is that in that acute stage of symptoms, probably the first few days, maybe for some a little bit longer if there is a more severe number of symptoms, is that they really reduce their activity, cognitive and

physical. But what you want to be doing though is start to increase that activity over time. So we don't black box kids until they are asymptomatic. That has a lot of likely negative effects on kids, obviously, being removed.

So what we do is we initially shut them down, restrict them, then we gradually start to bring them back into school and into physical activity, but that has to be individualized based, again, on the severity of that symptom presentation. And that is where we are right now. We need a whole lot of research to really help validate that.

Mr. TERRY. Thank you. And, Mr. Lance?

Mr. LANCE. No questions.

Mr. TERRY. Gentleman from Missouri gets to ask another question.

Mr. HARPER. Mississippi.

Mr. TERRY. Mississippi.

Mr. HARPER. No, I was just looking down.

Mr. TERRY. Yes, I thought you were Billy Long.

Mr. HARPER. That hurt. That hurt. Thank you, Mr. Chairman.

And a couple of questions that I would have. One would be, Dr. Gay, if I may ask a question?

Mr. GAY. Yes, sir.

Mr. HARPER. In your testimony, you state that football players at the elite levels are shedding equipment to increase speed and mobility.

Mr. GAY. Yes.

Mr. HARPER. The decision of which helmet to wear is their own, and that player often chooses a helmet's looks, shape, feel, perhaps, over its collision cushioning ability or safety features.

Do some positions require different levels of collision cushioning, and if so, would you recommend a special helmet for specific positions that would meet all current safety standards?

Mr. GAY. Yes, that is a great question.

Currently, there are no position-specific helmets being made. I think the helmet manufacturers try to do the best they can for everybody. I would say that, not to belabor the point, but I think for linemen, where you typically get no severe hits but a lot of subconcussive blows, that horse collar is crucial. I wouldn't recommend that a wideout wear a horse collar. That would really affect the quality of the play.

It is an interesting point because, certainly, some players might tend—and this is why I am an advocate for the Hits System. It will give us much more detailed information about which positions get hit where. One could envision, if we have a large database, then improving helmet design to react to that kind of information.

Mr. HARPER. OK. Dr. Graham, if I could ask you. How much money has been spent on sports concussion research, and where is most of the funding coming from for that research?

Mr. GRAHAM. That, unfortunately, was not an issue that our committee looked at, nor would we have had the resources to, you know, to pull it out.

Mr. HARPER. Sure.

Mr. GRAHAM. But, you know, clearly, you can identify some research that is being done in the Federal sector that applies to this,

but the private research that may be done by the sports leagues, by the manufacturers of equipment themselves, I don't know any good way to quantify that for you.

Mr. HARPER. Gotcha. All right. Well, look, I appreciate everybody being here, and it is a very important issue. We love our children going through sports, we love to watch it, and we don't want anybody being hurt that shouldn't be hurt. And so, hopefully, this increased focus will lead to better research, better safety equipment, detection, and, of course, prevention.

So thank you very much. Thank you, Mr. Chairman. I yield back.

Mr. TERRY. Thank you, the gentleman from Mississippi.

Mr. HARPER. Thank you.

Mr. TERRY. And I just want to thank all of you. This was truly an all-star panel of medical experts and physics. And much appreciated, Ian. Thank you.

And so that does conclude our hearing for today.

Now, for our witnesses, we, whether we showed up or not, have the right to send you a question, and it is called a written question. We have about 14 days to write those and submit them to you, and I appreciate a couple of weeks, not over, you don't have to do it right away, but at least if you can get them back to us, if there are any, within about 14 days.

And I just, again, want to thank you for coming out here and providing some very, very valuable testimony for us.

And we are adjourned.

[Whereupon, at 1:27 p.m., the subcommittee was adjourned.]

[Material submitted for inclusion in the record follows:]

FRED UPTON, MICHIGAN
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RANKING MEMBER

ONE HUNDRED THIRTEENTH CONGRESS

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December 19, 2014

Mr. William L. Daly III
Deputy Commissioner
National Hockey League
1185 Avenue of the Americas
New York, NY 10036

Dear Mr. Daly,

Thank you for appearing before the Subcommittee on Commerce, Manufacturing, and Trade on Thursday, March 13, 2014 to testify at the hearing entitled "Improving Sports Safety: A Multifaceted Approach."

Pursuant to the Rules of the Committee on Energy and Commerce, the hearing record remains open for ten business days to permit Members to submit additional questions for the record, which are attached. The format of your responses to these questions should be as follows: (1) the name of the Member whose question you are addressing, (2) the complete text of the question you are addressing in bold, and (3) your answer to that question in plain text.

To facilitate the printing of the hearing record, please respond to these questions by the close of business on Monday, January 5,2015. Your responses should be e-mailed to the Legislative Clerk in Word format at **Kirby.Howard@mail.house.gov** and mailed to Kirby Howard, Legislative Clerk, Committee on Energy and Commerce, 2125 Rayburn House Office Building, Washington, D.C. 20515.

Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,

Lee Terry
Chairman
Subcommittee on Commerce,
Manufacturing, and Trade

cc: Jan Schakowsky, Ranking Member, Subcommittee on Commerce, Manufacturing, and Trade
Attachment

Additional Questions for the Record

The Honorable Lee Terry

1. **You described the baseline testing initiated in 1997 for all players prior to each season. That information is used to help diagnose potential concussions and provide a standard measurement of when a player may return to play after a concussion (when their cognitive testing score returns to baseline). Has the NHL performed any longitudinal analysis to monitor players' baseline scores over the course of multiple seasons – for either all players or the subset who had suffered a concussion?**

   a. **If so, what does the data indicate and can that information be used to inform changes to further enhance player safety?**

   The NHL/NHLPA Concussion Subcommittee (the "Concussion Subcommittee") determines the protocol governing the baseline testing of NHL Players under the NHL/NHLPA Concussion Program, including as to the frequency and scope of Player testing (initially upon entering the League, and re-baselined either after suffering a head injury or after an intervening period of time in which no head injury has been known to occur), as well as the analyses to be conducted with the Player baseline and post-injury data. A longitudinal analysis has recently been authorized by the Concussion Subcommittee but remains in its nascent stages and there remains insufficient data on which to draw conclusions or to inform recommendations for change.

2. **During the hearing you described the changes the NHL has made to improve safety, include rules changes to reduce the number of unnecessary hits and fights. Have the players embraced the changes and the long history associated with the physical nature of the game? Have you seen a change in playing style for the better?**

   Yes, we have observed a noticeable change in Player behavior in recent years, which we believe is attributable -- at least in part -- to changes in Playing Rules that the League has implemented, including but not limited to new Rule 48, which makes it illegal for Players to deliver a hit that results "in contact with an opponent's head where the head was the main point of contact and such contact to the head was avoidable." The incidence of fighting in our game has also been reduced substantially with the introduction of Rule 9.7, which mandates the use of face visors that must be properly affixed to Player helmets, and Rule 46.6, which provides for a minor penalty to any Player who removes his helmet prior to engaging in a fight.

   We believe that changes in Player behavior have also been encouraged by, and have resulted from, the formation of the NHL Department of Player Safety, which is the first department of its kind in any major professional sports league and is dedicated to making the game on the ice as safe as it possibly can be for the Players without eliminating its inherently physical nature. The Department of Player Safety's objectives are accomplished both through its intensive education and Player outreach efforts, and also by its painstaking scrutiny of every play in every NHL game for the purpose of determining whether additional or "supplemental" discipline should be assessed to Players who violate the Playing Rules.

The fact that the game is safer today is borne out on a statistical basis as well. Specifically, with respect to fighting, fighting penalties for the 2014/15 Regular Season were down 16% over our totals for last season (2013/14), and down almost 40% from four seasons ago (2010/11). Roughly 70% of our Regular Season games are played without any fighting penalties being assessed. Similarly, in the area of what we would consider our more "violent" penalties -- e.g., Cross Checking, High Sticking, Slashing, Boarding, Roughing, etc. -- those penalties were also down this year (2014/15) from previous years virtually on an across the board basis.

3. **The NHL's Department of Player Safety is comprised of former world class players. Does that help "legitimize" its role and functions with the players and public? How many supplementary fines have they assessed players each year?**

Yes, we believe the identity of the League personnel making these critical decisions on Player safety matters is important to the credibility and relative "success" that the Department of Player Safety has experienced. Since its formation following the 2010/11 NHL season, the Department has been led and staffed by Hockey Hall of Fame members and former Players such as Brendan Shanahan, Brian Leetch, Rob Blake and Pat LaFontaine (Leetch and LaFontaine ranking among the best and most accomplished U.S.-born Players ever to play in the NHL). Additional elite-level former Players include current Department Head Stephane Quintal (16 NHL seasons) and future Hall of Fame Defenseman Chris Pronger (18 NHL seasons). These former Players understand every aspect of the game and their credibility among the population of current Players (as well as the general public) is beyond question or reproach.

In terms of fines and suspensions issued since the Department of Player Safety's formation in 2011, beginning with the current season (2014/15), there have been 27 Players suspended and 12 fined for on-ice transgressions during the Regular Season, with a total salary forfeiture approaching $1.3 Million (the salary forfeited by Players for on-ice conduct is contributed to the NHL/NHLPA Emergency Assistance Fund which, in turn, makes grants to former members of the NHL family (primarily former Players) who find themselves in situations of need). In the 2013/14 NHL season, 33 Players were suspended ($1.7 Million in forfeited salary) and 12 Players fined; in the 2012/13 NHL season, 17 Players were suspended ($715,000 in forfeited salary) and 7 Players fined (in a 48-game Regular Season); and in the 2011/12 NHL season, 34 Players were suspended ($2.45 Million in forfeited salary) and 34 Players fined.

4. **You stated that since 1997, all helmets have to be certified. Yet the league advises players to replace their helmets frequently to avoid the effects of degradations of aging helmets. Is that decision to replace determined only by the player? Is there a standard or limit to the age of helmets players can wear?**

Helmet manufacturers currently do not provide a designated "shelf life" or total number of recommended uses for their certified helmets. Beginning, initially in 2001, and continuing on a regular basis since, the NHL and the NHLPA have jointly communicated important information to Clubs and Players that has advised regarding the need to regularly maintain and where appropriate replace helmets in order to address and combat the aging and potential

degradation of helmet materials which may be related to their frequent use and the conditions under which NHL Player equipment is transported and utilized. These communications have included recommendations that Players replace their "home helmets" (helmets worn primarily with home game uniforms) for the start of every new season, and that they replace their "away helmets" (helmets worn primarily with away game uniforms) both at the start of every season and one additional time during the season. The information communicated by the NHL and NHLPA has also recommended immediate replacement of helmets that become badly scratched or gouged, or that otherwise have been involved in plays that do or may damage their structural integrity.

The Honorable Jan Schakowsky

1. **The National Hockey League (NHL) has taken important steps to address head injuries in professional hockey, but there is still room to make the game safer. I understand one area that the league has examined is equipment safety.**

   a. **Over the last decade, rules have been adopted requiring smaller and softer shoulder and elbow pads. What sort of results have these requirements produced?**

      The Rule requiring "all plastic surfaces that could come in contact with an opponent must be covered with a foam material" was adopted effective for the 2003/04 NHL season. The rule requiring that shoulder pad surfaces be covered with a foam material that is at least one-half (1/2) inch thick was adopted effective for the 2010/11 NHL season. While it is difficult to measure on-ice results with any material degree of accuracy given the multiple variables involved, we believe that all of the changes we have made (and are continuing to make) to "soften" the playing environment in which our Players perform (both equipment-related and otherwise) are, ultimately, beneficial to Player welfare and safety, and are reducing our Players' exposure to unnecessary injury (including head injury).

   b. **Has the league or have individual NHL officials investigated expanding these rules or making any further changes to shoulder, elbow or shin pads?**

      The 2012 Collective Bargaining Agreement with the Players provided for the creation of an NHL/NHLPA Protective Equipment Subcommittee, whose mandate is to "study and make recommendations with respect to the standards for protective equipment utilized by NHL Players to address the health and safety of the Players, as well as their opponents, and related issues at the direction of the [Joint Health and Safety Committee], while maintaining the integrity of the game." This Subcommittee currently is exploring whether further standards should be introduced with respect to the characteristics of shoulder pads and has engaged an independent engineer to provide guidance and expertise to the Subcommittee in connection with the project. The Subcommittee met most recently in January 2015, at which time it discussed other potential equipment projects and initiatives, and resolved to form new working task groups focusing on lacerations; foot and ankle injuries; and hand and wrist injuries.

2. **There tend to be a lot of collisions in the sport of ice hockey. There is no "out of bounds" – only boards and glass. It is intentionally played on a slippery surface. And all skaters are trying to gain and keep control of a very active, three-inch-wide disk made of vulcanized rubber. So there are lots of collisions. What I would like to address in this series of questions is how to prevent these collisions from resulting in brain injury to players.**

   a. **In written testimony submitted for the Subcommittee hearing on March 13, 2014, you stated that "the League has supported federal and state legislative efforts aimed at the establishment of concussion safety guidelines." Do you support making state concussion laws more protective of player health than those state laws recently enacted, and if so, in what ways? What specific federal legislation do you support?**

      The state legislation we have supported typically contain three fundamental components: (1) it provides for mandatory education on concussions to student athletes, parents and coaches; (2) it mandates immediate removal from play for all student athletes suspected of sustaining a concussion; and (3) it requires that return to play decisions be made by a licensed health care professional. In some states, proposed legislation speaks only to mandatory education for coaches and medical professionals; we believe, however, that this type of legislation is better directed at a broader audience, and we certainly support legislation that requires additional educational efforts be directed toward the student athletes themselves, as well as to their parents. We also feel strongly about the inclusion of a requirement that all return to play decisions be made by a licensed health care professional, an aspect that appears absent from some existing state legislation in this area.

      In terms of federal legislation, we have supported the Protecting Student Athletes from Concussions Act, introduced by Senator Durbin; the Youth Sports Concussion Act, introduced by Senator Udall; and the Concussion Treatment and Care Tools Act introduced by Senator Menendez.

   b. **There are several states where youth concussion laws cover only high school athletes, not those in younger grades or in extracurricular recreational leagues. Do you support the expansion of these laws to cover youth sports regardless of whether the athlete is participating on a high school team or another kind of team?**

      While we understand the logistical challenges (and cost) that may be associated with introducing extra safeguards to "lower levels" of sport, the National Hockey League does support the expansion in scope of concussion laws to all levels of organized sport. We support this particularly in a sport like hockey, where a large percentage of youth Players in the United States learn and hone their skills in youth programs unrelated to their schools. We also believe that such an expansion is appropriate given what we understand to be a higher risk level for mild traumatic brain injury among youth participants than among adult athletes.

c. I understand the NHL has partnered with Canadian junior hockey leagues to develop comprehensive new concussion education programs for its players. Will you, or have you, done the same with U.S. junior leagues, such as the USHL and Tier 2 and 3 leagues?

It is true that in our most recent Agreement with the Canadian Hockey League (operating as three constituent leagues -- the Ontario Hockey League, the Quebec Major Junior Hockey League and the Western Hockey League, with franchises in both Canada and the United States), we required the CHL -- the highest level junior hockey organization currently operating in North America -- to "engage professionals to provide education to its Players on the diagnosis and treatment of concussions, including the importance of reporting symptoms and the dangers associated with head injuries generally." The NHL is uniquely positioned to champion this initiative at the CHL level because of the nature of our longstanding contractual relationship with the CHL, pursuant to which we make financial payments directly related to the Players that our Clubs draft and sign from those junior leagues. The NHL's relationship with junior level hockey in the United States is not as direct in nature. Junior leagues in the United States (including the USHL and all Tier 2 and Tier 3 Programs) are governed and regulated exclusively by USA Hockey -- the body responsible for overseeing all youth and amateur hockey in the United States, including the national teams that represent the country in international competition. The NHL and our Member Clubs make an annual grant to USA Hockey to help fund and support their many initiatives in furtherance of growing and developing the sport of hockey in this country, but the development and implementation of those initiatives is largely left to the discretion of the USA Hockey organization. Having said that, and as I indicated at the hearing on March 13 as well as in my written testimony, we are very comfortable with the steps that USA Hockey has taken (both through rules implementation and educational initiatives) to make the sport of hockey safer, and to emphasize to everyone involved in the sport the paramount importance of Player health and safety.

d. In your written testimony, you mentioned that "a defining characteristic of the NHL/NHLPA Concussion Program is that it has functioned in a centralized manner since its inception." What drawbacks would you expect to see in programs that are not centralized like this?

The NHL/NHLPA Program has been set up as a centralized, League-wide program since its inception, with participation by and application to all NHL Clubs and all NHL Players. The advantage of a centralized system is that it enables all data to be stored in and accessed from a single location. Our team neuropsychologists function under the auspices of the League-wide Program and not under the direction or control of the individual Clubs. As a result, all Players are subject to the same concussion management protocol and education, irrespective of which Club they may be employed by at any particular time. In addition, because Players' data is maintained in a central database, when Players move from Club to Club (which can be quite frequently in our industry), their data follows them and is available to medical care professionals who treat them for later injuries incurred while working for different employers. Programs that are not centralized in nature, generally do not allow for the same amount and scope of data transfer and sharing; do not allow for centralized data collection and analysis; and do not allow for the same level and consistency of care and treatment.

e. **A January 2014 study released by St. Michael's Hospital in Toronto found that over three recent seasons, the NHL's teams collectively paid an average of $218 million per season to players sidelined by injury. The author of the study said that "N.H.L. owners need to do a better job of protecting their athletes — if not for their players, then for their own pocketbooks." The study's researchers estimated that concussions were among the most financially costly injuries, totaling almost $43 million of the $218 million average total. The medical and personal well-being of players should come first, of course. But I found it interesting that it may make good financial sense for the NHL to reduce concussions as well. Does the NHL believe that reducing concussions is in its best financial interests?**

As an initial matter, it is important to note that the information cited in the St. Michael's study is not consistent with the data collected and maintained internally by the NHL, and, as a result, we neither agree with nor are willing to adopt or endorse the study's main conclusions. Having said that, we do agree that a reduction in the incidence of head injuries (and indeed all other Player injuries in our sport) is an objective that is shared collectively by the NHL, the NHLPA, all NHL Clubs and all NHL Players. That shared objective drives us constantly to examine and analyze injuries in our game -- including how, where, when and why they happen -- and to develop ways in which the overall number of injuries can be reduced, and their severity minimized. Concussions are one type of Player injury that is "costly" to our Clubs, in terms of both the Clubs' ability to ice competitive teams and in terms of the financial impact associated with having to continue to pay Players who are unable to perform due to injury (Player contracts in the NHL, unlike in a number of other professional sports, are 100% guaranteed for non-performance due to Player injury). This certainly is a compelling reason -- if not the most compelling reason -- for the NHL to continue its unrelenting efforts to reduce head injuries in our game.

FRED UPTON, MICHIGAN
CHAIRMAN

HENRY A. WAXMAN, CALIFORNIA
RANKING MEMBER

ONE HUNDRED THIRTEENTH CONGRESS

Congress of the United States

House of Representatives

COMMITTEE ON ENERGY AND COMMERCE

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December 19, 2014

Mr. Dave Ogrean
Executive Director
USA Hockey
1775 Bob Johnson Drive
Colorado Springs, CO 80906

Dear Mr. Ogrean,

Thank you for appearing before the Subcommittee on Commerce, Manufacturing, and Trade on Thursday, March 13, 2014 to testify at the hearing entitled "Improving Sports Safety: A Multifaceted Approach."

Pursuant to the Rules of the Committee on Energy and Commerce, the hearing record remains open for ten business days to permit Members to submit additional questions for the record, which are attached. The format of your responses to these questions should be as follows: (1) the name of the Member whose question you are addressing, (2) the complete text of the question you are addressing in bold, and (3) your answer to that question in plain text.

To facilitate the printing of the hearing record, please respond to these questions by the close of business on Monday, January 5, 2015. Your responses should be e-mailed to the Legislative Clerk in Word format at **Kirby.Howard@mail.house.gov** and mailed to Kirby Howard, Legislative Clerk, Committee on Energy and Commerce, 2125 Rayburn House Office Building, Washington, D.C. 20515.

Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,

Lee Terry
Chairman
Subcommittee on Commerce,
Manufacturing, and Trade

cc: Jan Schakowsky, Ranking Member, Subcommittee on Commerce, Manufacturing, and Trade
Attachment

The Honorable Jan Schakowsky

1. There tend to be a lot of collisions in the sport of ice hockey. There is no "out of bounds" – only boards and glass. It is intentionally played on a slippery surface. And all skaters are trying to gain and keep control of a very active, three-inch-wide disk made of vulcanized rubber. So there are lots of collisions. What I would like to address in this series of questions is how to prevent these collisions from resulting in brain injury to players.

    a. A report last year from St. Michael's Hospital stated that up to one-quarter of players on some minor league hockey teams will suffer a concussion in a season. Briefly, what would you recommend as your top three steps to take to reduce that number?

    Preventative measures are critical, specifically: 1) educating stakeholders; 2) wearing equipment in compliance with manufacturer instructions; and 3) making changes to rules and policies as warranted.

    Education: *USA Hockey has developed educational materials for players, coaches, parents and officials. A standardized concussion management program addresses diagnosis, removal from play, initial management and a functional return to play program (see detailed USA Hockey Concussion Management Program at end of this response).*

    Equipment: *USA Hockey took a significant step in 1978 when it called for the creation of the Hockey Equipment Certification Council. HECC's mission is to seek out, evaluate and select standards and testing procedures for hockey equipment for the purpose of product certification. It is a completely independent body. The HECC certification program validates the manufacturers' certification that the equipment they produce has been tested and meets the requirements of the most appropriate performance standards.*

    Rules Enforcement/Modification: *USA Hockey has emphasized the importance of eliminating dangerous behaviors that have been associated with injury, including concussion. Enforcement of existing rules and more stringent penalties for charging, boarding, checking-from-behind, and hits to the head will continue to help reduce injuries. Recent rule changes include a penalty for both intentional and unintentional hits to the head. In addition, in 2011, USA Hockey eliminated legal body checking at the Peewee level (ages 11-12). That change was adopted by Hockey Canada two years later.*

b. In written testimony submitted to the Subcommittee for the hearing on March 13, 2014, you did not address fighting, which is a major cause of concussions among hockey players. Please detail USA Hockey's initiatives to continually reduce fighting in the leagues you oversee.

In youth hockey there is next to no fighting. Any player that does fight is ejected from the game and penalties are increasingly severe for any additional fighting penalty in the same season. USA Hockey also oversees three different levels of junior hockey (Tier I, II, III) that includes more than 180 teams (players are ages 16-20). A concerted effort to eliminate dangerous behavior -- including fighting, checking-from-behind, boarding, head contact, charging, kneeing, elbowing, butt-ending, and spearing – is on-going. At the Tier I and II level, a major penalty plus a misconduct penalty are assessed for fighting. Further, a player record is kept to document all penalties noted above and the player is further penalized with increasing severity by reaching various thresholds. Over the past three seasons, the incidence of fighting in the USHL, which is the top junior league in America, has been more than cut in half. At the Tier III level, a major penalty plus a game disqualification penalty is assessed for fighting.

2. Last year, Representative Pascrell introduced H.R. 2118, the Youth Sports Concussion Act. The Act would allow for the creation and implementation of standards to improve the safety of sports equipment. The Act would also specifically target deceptive health and safety-related marketing claims for sports equipment.

a. My understanding is that the NHL and USA Hockey support this bill. What is your experience in youth hockey with equipment designed to reduce concussions?

We support all efforts to reduce the incidence and severity of concussion. Although there is no current evidence to prove that helmets, mouthguards or force sensors can prevent concussion, research is necessary to improve equipment design and materials with the goal of reducing risk.

b. Have you seen misleading safety-related marketing claims for hockey gear? If so, what were the types of products being advertised with such claims, and what claims were made?

Numerous devices attached to the helmet, chinstrap, mouthpiece and head have been advertised as a means of alerting players, coaches and parents if high single or cumulative forces have occurred. We are continually striving for better ways to diagnosis and treat concussion in hockey, including the quantitative observation of force transmission to the brain; but these

devices do not diagnose a concussion or reliably guide management. There is likely some merit for a device that measures acceleration of the head. Certainly, the sensor does heighten awareness and promote the removal of athletes from play. However, from a clinical perspective, the efficacy of these devices is currently unknown. We are unable to predict linear and/or rotational G-force thresholds for individual athletes, so we must rely on observed mechanism of injury, reported symptoms and a concussion examination to test neurologic function, memory, recall concentration and balance in order to make the diagnosis.

USA Hockey has sponsored in-depth research on concussion in junior hockey using instrumented helmets and videotape game analysis to better understand these relationships. Additional clinical research is necessary to show that use of these sensors can improve concussion diagnosis and aid prevention. Several issues will need to be addressed before widespread application of this technology, such as player monitoring, protocol for enforcement and return to play criteria.

c. Does USA Hockey endorse any equipment intended to reduce concussions?

We support all efforts to reduce the incidence and severity of concussion. Helmets, face masks and mouthguards are mandatory equipment in youth ice hockey, however, there is no current evidence to prove that any of the above can prevent concussions. They may decrease severity.

d. Does your organization support giving the Consumer Product Safety Commission the authority to set minimum equipment safety standards in cases where no voluntary standard is adopted?

Without knowing specifics, that is difficult to answer. As noted earlier in this document, however, in 1978 USA Hockey took a significant step when it called for the creation of the Hockey Equipment Certification Council. HECC's mission is to seek out, evaluate and select standards and testing procedures for hockey equipment for the purpose of product certification. It is a completely independent body. The HECC certification program validates the manufacturers' certification that the equipment they produce has been tested and meets the requirements of the most appropriate performance standards. It has been an extremely valuable body that has taken its role seriously and has been an important part of the safety story in our sport for over 35 years.

# # # # #

Concussion Management Program

Michael Stuart MD
Alan Ashare MD

The standard of care for current medical practice and the law in many states requires that any athlete with a ***suspected*** concussion is ***immediately removed from play***.

- A concussion is a traumatic brain injury- ***there is no such thing as a minor brain injury.***
- A player does not have to be "*knocked-out*" to have a concussion- ***less than 10% of players actually lose consciousness.***
- A concussion can result from a blow to head, neck or body.
- Concussions often occur to players who don't have or just released the puck, from open-ice hits, unanticipated hits and illegal collisions.
- The youth hockey player's brain is more susceptible to concussion.
- In addition, the concussion in a young athlete may be harder to diagnosis, takes longer to recover, is more likely to have a recurrence and be associated with serious long-term effects.
- Treatment is individualized and it is impossible to predict when the athlete will be allowed to return to play- ***there is no timetable.***

A player with any symptoms or signs; disorientation; impaired memory, concentration, balance or recall has a concussion.

Remember these steps:

1. Remove immediately from play (training, practice or game)
2. Inform the player's parents
3. Refer the athlete to a qualified health-care professional
4. Treatment begins with complete physical and cognitive rest
5. When free of symptoms, the athlete begins a graded exertion protocol.
6. Medical clearance is required for return to play

Diagnosis

Players, coaches, parents and heath care providers should be able to recognize the symptoms and signs of a concussion:

Symptoms

- Headache
- Nausea
- Poor balance
- Dizziness
- Double vision
- Blurred vision
- Poor concentration
- Impaired memory
- Light Sensitivity
- Noise Sensitivity
- Sluggish
- Foggy
- Groggy
- Confusion

Signs

- Appears dazed or stunned
- Confused about assignment
- Moves clumsily
- Answers slowly
- Behavior or personality changes
- Unsure of score or opponent
- Can't recall events after the injury
- Can't recall events before the injury

Management Protocol

1. If the player is unresponsive- call for help & dial 911

2. If the athlete is *not breathing*: start CPR
- ✓ DO NOT move the athlete
- ✓ DO NOT remove the helmet
- ✓ DO NOT rush the evaluation

3. Assume a neck injury *until proven otherwise*
- ✓ DO NOT have the athlete sit up or skate off until you have determined:
  - no neck pain
  - no pain, numbness or tingling
  - no midline neck tenderness
  - normal muscle strength
  - normal sensation to light touch

4. If the athlete is conscious & responsive without symptoms or signs of a neck injury…

- help the player off the ice to the locker room
- perform an evaluation
- do not leave them alone

5. Evaluate the player in the locker room:

- Ask about concussion ***symptoms*** (How do you feel?)
- Examine for ***signs***
- Verify ***orientation*** (What day is it?, What is the score?, Who are we playing?)
- Check ***immediate memory*** (Repeat a list of 5 words)
- Test ***concentration*** (List the months in reverse order)
- Test ***balance*** (have the players stand on both legs, one leg and one foor in front of the other with their eyes closed for 20 seconds)
- Check ***delayed recall*** (repeat the previous 5 words after 5-10 minutes)

6. A player with any symptoms or signs, disorientation, impaired memory, concentration, balance or recall has a concussion.

"When in doubt, sit them out"

- Remove immediately from play (training, practice or game
- Inform the player's parents
- Refer the athlete to a qualified health-care professional
- Medical clearance is required for return to play

7. If any of the signs or symptoms listed below develop or worsen: go to the hospital emergency department or dial **911**.

- Severe throbbing headache
- Dizziness or loss of coordination
- Memory loss or confusion
- Ringing in the ears (tinnitus)
- Blurred or double vision
- Unequal pupil size
- No pupil reaction to light
- Nausea and/or vomiting
- Slurred speech
- Convulsions or tremors
- Sleepiness or grogginess
- Clear fluid running from the nose and/or ears
- Numbness or paralysis (partial or complete)
- Difficulty in being arouse

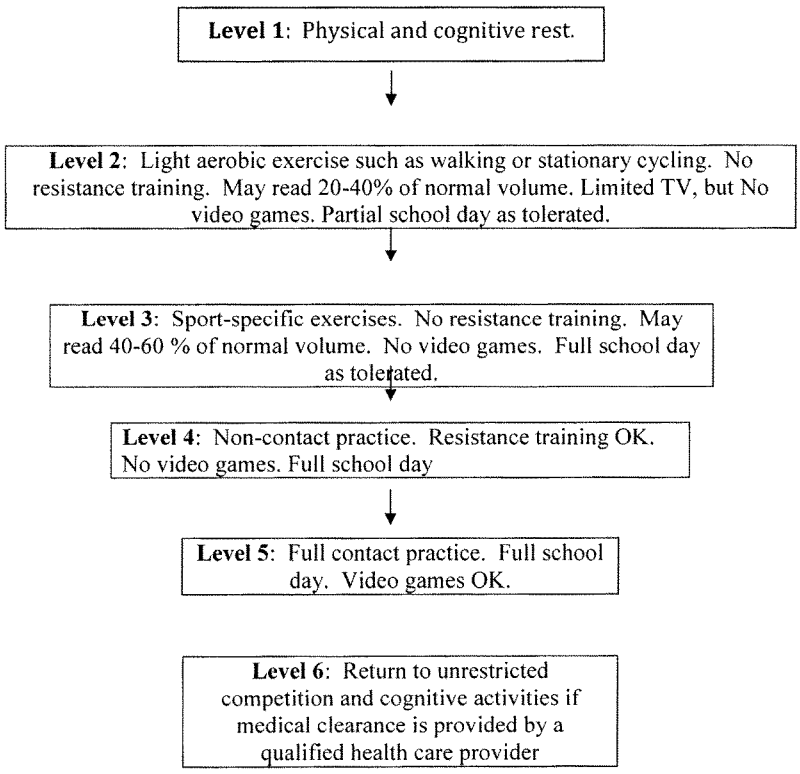
8. An athlete who is *symptomatic* after a concussion requires complete ***physical*** and ***cognitive rest.***

- A concussed athlete should not participate in any physical activity, return to school, play video games or text message if he or she is having symptoms at rest.
- Concussion symptoms & signs *evolve over time*- the severity of the injury and estimated time to return to play are unpredictable.

USA Hockey Post-Concussion Functional Return to Play Protocol

This protocol should not be initiated until after the athlete has been released to participate in the functional return to play protocol by a qualified health care provider. ***If symptoms appear during a functional test, the test should be stopped and the athlete monitored until symptoms resolve***. No further functional testing should be performed that day. Functional testing may resume the following day at the previously asymptomatic level if the athlete remains asymptomatic. If symptoms do not resolve, appropriate medical attention should be obtained.

After each phase of functional testing, the presence of post-concussive symptoms should be assessed and progression to the next phase of functional testing will require the absence of post-concussive symptoms. Each phase requires ***a minimum of 1 day*** before progressing to the next phase.



FRED UPTON, MICHIGAN
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RANKING MEMBER

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Congress of the United States

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December 19, 2014

Mr. Jeffrey Miller
Senior Vice President
Player Health and Safety Policy
National Football League
345 Park Avenue
New York, NY 10154

Dear Mr. Miller,

Thank you for appearing before the Subcommittee on Commerce, Manufacturing, and Trade on Thursday, March 13, 2014 to testify at the hearing entitled "Improving Sports Safety: A Multifaceted Approach."

Pursuant to the Rules of the Committee on Energy and Commerce, the hearing record remains open for ten business days to permit Members to submit additional questions for the record, which are attached. The format of your responses to these questions should be as follows: (1) the name of the Member whose question you are addressing, (2) the complete text of the question you are addressing in bold, and (3) your answer to that question in plain text.

To facilitate the printing of the hearing record, please respond to these questions by the close of business on Monday, January 5, 2015. Your responses should be e-mailed to the Legislative Clerk in Word format at **Kirby.Howard@mail.house.gov** and mailed to Kirby Howard, Legislative Clerk, Committee on Energy and Commerce, 2125 Rayburn House Office Building, Washington, D.C. 20515.

Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,

Lee Terry
Chairman
Subcommittee on Commerce,
Manufacturing, and Trade

cc: Jan Schakowsky, Ranking Member, Subcommittee on Commerce, Manufacturing, and Trade
Attachment

MR. JEFFREY MILLER'S ANSWERS TO THE QUESTIONS FOR THE RECORD FROM THE SUBCOMMITTEE ON COMMERCE, MANUFACTURING AND TRADE OF THE HOUSE COMMITTEE ON ENERGY AND COMMERCE FOLLOWING THE "IMPROVING SPORTS SAFETY: A MULTIFACETED APPROACH" ON MARCH 13, 2014

QUESTIONS FROM RANKING MEMBER JAN SCHAKOWSKY (IL-09)

1. Football is a high-impact sport, and helmets cannot prevent all head injuries. However, in a September 2012 article, Sam Borden of the New York Times wrote, "[e]ven as head injuries have become a major concern, the N.F.L. has neither mandated nor officially recommended the helmet models that have tested as the top performers in protecting against collisions believed to be linked to concussions. Some players choose a helmet based on how it looks on television, or they simply wear the brand they have been using their whole career, even if its technology is antiquated. As a consequence, despite lawsuits related to head injuries and the sport's ever-increasing speed and violence, some players are using helmets that appear to place them at greater risk." Players on the New York Giants, among others, were interviewed for this piece. Linebacker Keith Rivers, then a member of the Giants, "said there was no doubt that 'a lot of guys go looks first,' preferring more classic models," and suggested that some newer models "are turnoffs to some even if they rate higher in safety tests." The article also reported that certain franchises may fail to get players the helmet they request in a timely manner. Given the severe consequences possible from brain injuries, it would be very concerning if the National Football League (NFL) did not take helmet safety seriously enough to ensure that the helmets used on the field are among those that provide the best protection possible to players. Moreover, other football leagues and players nationwide look to the NFL, the top football league in the country, as an example; as such, the NFL should strive to promote helmets that provide the highest level of protection and verify that such helmets are being used on its field of play.

I understand that league activities, guidelines, policies, or requirements may be subject to negotiations with other parties. Nevertheless, please answer the following questions directly and concisely.

a. *Does the NFL believe that it is advisable for professional football players playing in the NFL to wear helmets that do not place among the top performers in protecting against collisions believed to be linked to concussions?*

The health and safety of our players is the NFL's first priority. Players are required to wear helmets that pass the certification standards set by the National Operating Committee on Standards for Athletic Equipment (NOCSAE). The NFL is closely monitoring NOCSAE's proposed new performance standards for helmets that will include testing for forces that are specific to concussion risk. At each club, equipment staff, athletic trainers, and other club personnel are required to have available a full range of helmets, including the most current models, for players to use, and club staff encourage players to use the most up-to-date helmets. In addition, helmets worn by players are reconditioned at least once a year, and often more frequently.

To keep our players informed of advances in safety, the NFL regularly provides information regarding helmet performance. In 2010, the NFL and NFLPA jointly shared the results of research on helmet performance with all clubs and players. More recently, the League has required all clubs to have the Virginia Tech Helmet Ratings in every NFL locker room. During the past few years, the university has produced the first-of-its-kind star-rating system, which measures and ranks the effectiveness of a wide range of helmets.

The NFL is also investing in scientific and medical research to spur the improvement of protective equipment. In 2013, the NFL partnered with GE and Under Armour to launch the Head Health Initiative, a four-year, $60 million collaboration designed to improve the health and safety of not only football players, but all athletes, members of the military, and the general public by furthering concussion research and innovation. The second phase of this initiative, launched in September 2013, is a $10 million innovation challenge that focuses specifically on identifying and developing novel technologies that protect against brain injury. Winners of the first round of challenges were announced late last year; the results are available at www.headhealthchallenge.com.

Finally, through our Head, Neck, and Spine Committee, the NFL has assembled a team of engineers, biomechanical experts, and material scientists to undertake a comprehensive analysis of helmet performance, including an assessment of current performance standards and alternatives for helmet design and construction that could lead to improved performance. We are also exploring joint research projects with the National Institute on Standards and Technology (NIST) that would focus on identifying materials that would better mitigate forces experienced in a wide range of settings, including sports and in the military. We believe that the combination of this research holds promise for identifying headgear that will provide superior protection for athletes in many different sports.

b. ***Does the NFL believe that it is advisable for amateur players of tackle football to wear helmets that do not place among the top performers in protecting against collisions believed to be linked to concussions?***

The NFL advises all football players, at all levels of the sport, to wear the safest possible available equipment. Accordingly, we work to ensure that youth football players have access to and utilize the most advanced protective gear available, and that coaches have access to the latest safety information to protect their players.

To promote this effort, since 1998, the NFL has provided millions of dollars of equipment grants to youth football organizations. Since 2006, those grants have been administered by USA Football, the NFL's youth football partner.

In 2012, the NFL partnered with the U.S. Consumer Protection Safety Commission and a number of other organizations to launch a helmet replacement program. This initiative provided helmets to underserved communities and removed ones that were more than 10 years old at no cost to the beneficiary leagues.

In 2013, the NFL continued these efforts with USA Football. Through the equipment grant program, youth football leagues in underserved communities are eligible to apply for grants that provide new or reconditioned helmets for youth leagues at no cost.

In addition, through USA Football's Heads Up Football program, more than 120,000 coaches have been trained in the past two years in helmet fitting. According to many experts in the field, the first step to helmet safety is the proper fit of the helmet on the individual player.

Since 2006, the NFL's charitable entities have made more than $8 million in equipment grants primarily for youth football organizations based on need. In 2014, for example, 751 youth football organizations and 187 high schools received equipment for a total of 938 grants. The average grant size was slightly more than $1,000 for a total of $1 million in grants.

c. ***Does the NFL commit to supporting a prohibition on NFL players wearing helmets on its fields of play that are more than 10 years old?***

NFL players are not issued and do not wear helmets that are 10 years old or older, so such a prohibition is consistent with the NFL's existing safety policies and practices. As outlined in 1a., the League requires all NFL players to wear helmets that meet the safety standards set by NOCSAE; clubs encourage players to use the most up-to-date helmets; and helmets worn by players are reconditioned at least once per year and in accordance with standards set by the National Athletic Equipment Reconditioning Association (NAERA). NAERA members will not recondition or recertify any helmet 10 years of age or older.

d. ***Does the NFL commit to support a policy position that the use of helmets on an NFL field of play that are more than 10 years old presents an unacceptable safety risk?***

The NFL requires all NFL players to wear helmets that meet the safety standards set by NOCSAE and that are reconditioned according to standards set by the National Athletic Equipment Reconditioning Association (NAERA). NAERA members will not recondition or recertify any helmet 10 years of age or older.

e. ***Does the NFL commit to support a policy position recommending that all helmets used for tackle football, whether professional or amateur, be discarded after 10 years?***

The NFL supports all tackle football players wearing helmets that meet the safety standards set by NOCSAE and that are reconditioned according to the standards set by NAERA, as outlined in answer 1d. As noted above, the NFL and other entities have had a multi-year program to remove and replace older helmets in youth football programs.

f. ***Does the NFL commit to support a policy position that all tackle football players, whether professional or amateur, wear helmets that are reconditioned properly, such as in accordance with a process approved by the National Athletic Equipment Reconditioning Association?***

The NFL supports all tackle football players wearing helmets reconditioned properly and in accordance to standards set by NAERA, as outlined in answer 1d.

2. I understand that the NFL and its players have already agreed on adjustments to the offseason and to gameplay for the sake of safety, and I understand that league activities, guidelines, policies, or requirements may be subject to negotiations with other parties. Nevertheless, please answer the following questions directly and concisely.

a. ***Is the NFL currently considering, or in the past year has it considered, supporting an expansion of the regular season to 18 games?***

During the negotiations that led to the 2011 collective bargaining agreement (CBA) with the NFL Players Association, the NFL discussed changing the structure of the 20-game season from four preseason and 16 regular season games to two preseason and 18 regular season games. This change was not incorporated into the new CBA, and there can be no change in the structure of the 20-game season without agreement with the NFLPA.

b. ***Do you think that an 18-game season would have more injuries than a 16-game season?***

Because under the discussions referenced in 2a., the season would remain at 20 games, and only the balance between preseason and regular season games would change, it is not clear that there would be any impact on rates of injuries over the course of a season. The amount of playing time on the field may be one factor that relates to risk of injury, but it is not the only factor. In fact, because the amount of contact in practice is sharply reduced during the regular season, the overall number of injuries would likely not change significantly.

Moreover, any change in the structure of the season would be accompanied by other changes in roster size, practice rules, and the like, to mitigate any increased injury risk. Changes to playing rules, discipline enforcement, coaching, and overall culture change also impact the injury rate. Examples of such recent changes designed to decrease injuries include the following: new rules protecting defenseless receivers, eliminating the use of the crown of the helmet to initiate contact, moving the restraining line for the kicking team from the 30- to the 35-yard line; and mandating that players use protective thigh and knee equipment. As a result of such rules changes, discipline, and enforcement, the number of concussions dropped by 13%, and concussions caused by helmet-to-helmet hits decreased by 23% from the 2012 season to the 2013 season.

c. ***Another witness at the March 13, 2014, Subcommittee hearing, Dr. Timothy Gay, recommended that the NFL reduce its regular-season schedule to 14 games, in order to have fewer injuries to players. Is the NFL currently considering, or has it previously considered, supporting the contraction of the regular-season schedule to 14 games? Please explain your answer.***

The League has not considered such a contraction and has maintained the same number of regular-season games since 1978, when the regular-season schedule increased from 14 to 16 games, with a corresponding reduction in the number of preseason games from six to four.

d. ***Is the NFL currently considering, or has it previously considered, supporting a reduction of the number of preseason games?***

A reduction in the number of preseason games was considered in the context of the 2011 negotiations. The League regularly reviews the preseason in an effort to provide opportunities for player development, as well as ensuring value for our fans, among other factors.

e. ***Does the NFL support reducing the number of preseason games to two, and if not, why not?***

Please see 2d.

f. ***In written testimony, you discussed moving the kickoff – does the NFL support other kickoff changes, including elimination of the kickoff return?***

As I indicated in my testimony, in 2011, the League moved the restraining line for the kicking team from the 30- to the 35-yard line. This rule change achieved its intended effect to increase the number of touchbacks, and contributed to a 40 percent reduction in the number of concussions occurring during kickoffs compared to the 2010 season. In addition to that change, the League also implemented rule changes in recent years requiring all kicking team players other than the kicker to line up no more than five yards behind their restraining line, eliminating the 15-20 yard running "head start" that had become customary for many players, and prohibiting blocking formations that posed particular risks to players of both the kickoff and kickoff return team. The NFL will continue to review, modify, and change playing rules, including to the kickoff, when necessary, justified, or warranted in order to better protect players, eliminate dangerous techniques, and reduce the risk of injuries.

g. ***Would the NFL support promoting adoption of the neck collar, horse collar, or similar equipment by NFL players? Would the NFL support requiring the use of the neck collar, horse collar, or similar equipment by linemen?***

To my knowledge, the NFL Competition Committee has not received and is not actively considering such a recommendation to mandate the use of the neck collar or horse collar by players, including linemen. I also am not aware of any recent data, findings, or effort within the player or medical community to support implementing such a requirement.

h. ***Do you agree with concerns that have been expressed regarding a running back keeping his head up? For example, Emmitt Smith said, "If I'm a running back and I'm running into a linebacker, you're telling me I have to keep my head up so he can take my chin off?"***

No, I do not agree. The NFL continues to modify its rules in order to better protect players from dangerous and illegal hits, particularly those to the head and neck area, and to promote better player safety. We want players to keep their heads up and "out of the game." In fact, the NFL in 2013 strengthened its rules to prohibit a runner or tackler from initiating forcible contact by delivering a blow

with the top or crown of his helmet against an opponent when both players are clearly outside the tackle box. The rule was intended to eliminate and prevent the dangerous technique of players lowering their heads and "spearing" opponents. The illegal technique poses a serious and unnecessary danger to the health and safety of the player delivering the blow, as well as the player receiving it. The League wants its players, as well as athletes at all levels of the sport, to be safe and to play the game the right way.

FRED UPTON, MICHIGAN
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ONE HUNDRED THIRTEENTH CONGRESS

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December 19, 2014

Mr. Scott Hallenbeck
Executive Director
USA Football
45 North Pennsylvania Street, Suite 700
Indianapolis, IN 46204

Dear Mr. Hallenbeck,

Thank you for appearing before the Subcommittee on Commerce, Manufacturing, and Trade on Thursday, March 13, 2014 to testify at the hearing entitled "Improving Sports Safety: A Multifaceted Approach."

Pursuant to the Rules of the Committee on Energy and Commerce, the hearing record remains open for ten business days to permit Members to submit additional questions for the record, which are attached. The format of your responses to these questions should be as follows: (1) the name of the Member whose question you are addressing, (2) the complete text of the question you are addressing in bold, and (3) your answer to that question in plain text.

To facilitate the printing of the hearing record, please respond to these questions by the close of business on Monday, January 5, 2015. Your responses should be e-mailed to the Legislative Clerk in Word format at **Kirby.Howard@mail.house.gov** and mailed to Kirby Howard, Legislative Clerk, Committee on Energy and Commerce, 2125 Rayburn House Office Building, Washington, D.C. 20515.

Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,

Lee Terry
Chairman
Subcommittee on Commerce,
Manufacturing, and Trade

cc: Jan Schakowsky, Ranking Member, Subcommittee on Commerce, Manufacturing, and Trade
Attachment

Scott Hallenbeck, Executive Director, USA Football, January 9, 2015

Additional Questions for the Record

The Honorable Jan Schakowsky

1. **Football helmets, especially in youth and high school football, are often reconditioned, which involves cleaning of pads and hardware and the repair or replacement of parts as needed. Beginning in 2012, the National Athletic Equipment Reconditioners Association (NAERA) implemented a policy that it will not refurbish football helmets that are 10 or more years old. In announcing this policy, NAERA President Ed Fisher told the *New York Times*, "I would want my son, and anybody's son, to be in a helmet less than 10 years old. We need to get the older ones off the field."**

   a. **As "football's national governing body," does USA Football require that teams replace all helmets 10 or more years old? Why or why not?**

      USA Football follows NAERA's policy of replacing helmets within 10 years in its National Teams program. USA Football publicly reinforces to the high school and youth football community – our primary constituents – NAERA's policy that 10-year-old football helmets shall not be reconditioned (through our website, usafootball.com). Moreover, USA Football provides high school and youth football programs with equipment grants to help them adhere to NAERA's policy and replace helmets.

   b. **New football helmets can cost from $100 to $400 each. How often do youth football teams typically replace helmets with newer models?**

      The frequency for youth football teams to replace helmets varies greatly by league. USA Football does not operate or administer youth tackle football organizations, however, we provide information on best practices – including helmet replacement – as well as provide resources for leagues to meet these best practices wherever possible, including equipment grants.

   c. **Does USA Football require teams to have their helmets reconditioned on a regular basis? If so, how often must youth team helmets be reconditioned? If not, how often do youth football teams typically recondition their helmets?**

      Our organization does not operate or administer youth tackle football organizations. As such, USA Football is not in a position to require helmet reconditioning outside of its own National Team program.

      For the U.S. National Team Program, USA Football adheres to guidelines set forth by helmet industry experts, which recommend helmets be reconditioned no less than every two years. USA Football promotes the guidelines to high school and youth programs and works to provide access to helmet reconditioning through equipment grants.

Scott Hallenbeck, Executive Director, USA Football, January 9, 2015

To the best of our knowledge, research of a national scope has yet to be conducted concerning the frequency of youth football helmet reconditioning.

2. **According to a report in the *New York Times*, football helmets more than 10 years old are worn by about 100,000 young players every season. In 2012, USA Football and the Consumer Product Safety Commission, partnered with a number of public and private entities on a pilot program to replace youth football helmets 10 years old or older in an effort to better protect the safety of young players.**

    a. **Has the helmet replacement program continued past its initial 2012 pilot? If so, how many helmets have been replaced in each year since the partnership began in 2012? If not, why not?**

    After the 2012 pilot, the program shifted from a replacement approach to a reconditioning approach. Rather than replacing 10-year-old and older helmets and leaving the remaining helmet inventory untouched, leagues applied for a grant to have some or all of their helmet inventory reconditioned. If any of the helmets submitted for reconditioning were more than 10 years old, the league received a voucher to replace the old helmets. This shift was made following the pilot year to allow more leagues to benefit from the program, to streamline program operations, and to improve the impact of the program. During the 2012 pilot program, 4,000 helmets were surrendered.

    b. **What was the average age of the helmets that were replaced through the program?**

    We do not have this data.

    c. **When do you expect that we will eliminate all youth helmets over 10 years old?**

    The pilot program led us to believe that there are leagues who recondition and refresh their inventories frequently, and those who recondition rarely or never. These often under-resourced leagues can be difficult to access, so education is key to reaching these leagues and persuading them of the value of appropriately maintaining their helmet inventory. USA Football promotes to the high school and youth football community that helmets older than 10 years are to be retired, per NAERA's recommendation.

3. **I appreciate the steps USA Football has taken to address the safety of young athletes around the country as they learn how to play football. Football is one of the nation's most high-profile sports, and implementing best practices at the youth level is critical.**

    In written testimony submitted for the Subcommittee hearing on March 13, 2014, you mentioned that not only has USA Football sought to teach young players how to play the game right, but also that your organization donated $1 million last year for equipment and uniforms, based on need and merit.

    a. **The safety of equipment is an important factor in player safety. What steps do you take to test the quality of the equipment that is donated by USA Football?**

The grants awarded through USA Football's $1 million football equipment grant program are vouchers to purchase new equipment. The recipient of the grant, not USA Football, selects the equipment purchased through the grant program.

We are expanding size of our equipment grant program from $1 million to $1.5 million in 2015 and may add helmet reconditioning as a grant option.

b. **Is the donated equipment mostly new or reconditioned? For reconditioned equipment, how do you ensure that it is properly reconditioned?**

USA Football awards vouchers. These vouchers may be used to purchase new equipment and may be used to recondition existing equipment.

c. **What percent of the $1 million in equipment donated last year was awarded based on need?**

USA Football equipment grant program recipients all have a level of need. Through our independent funding of this program, we are able to financially fulfill more than 900 of the 2,000-plus applications that we received in 2014.

d. **Data from 2010 indicates that 500,000 young football players, particularly in poorer communities, wore helmets that autumn which had not undergone basic reconditioning. I would think that your organization would be in a perfect position to alleviate this problem, which endangers the brain health of so many young football players in the country. In cases where new football helmets are not an option, what is USA Football capable of doing to get properly reconditioned helmets to these young football players, whose programs or school districts so often cannot afford the expense of reconditioning? Does your organization have concrete plans to expand its role in this area?**

USA Football recently created a foundation that will focus on improving access to the sport. Assisting high schools and youth leagues in reconditioning helmets is a potential program for the USA Football Foundation.

4. **A key component of USA Football's sports concussion efforts is its "Heads Up Tackling" initiative, which teaches young players tackling techniques intended to reduce the incidence of concussions. However, in a recent article on ESPN.com, investigative reporters Steve Fainaru and Mark Fainaru-Wada, authors of the book *League of Denial*, highlighted statements raised by critics questioning the usefulness of the program, including one from a former NFL player describing Heads Up as "a product that the NFL is selling" to "create the illusion that the game is safe or can be made safe."**

a. **Does USA Football monitor and record injury data for both its tackle and flag football programs?**

To clarify, USA Football's Heads Up Football® program is our country's only youth and high school sport-specific player safety and coaching education program

endorsed by multiple leading medical organizations as well as a sport's leaders on youth, high school, collegiate and professional levels. As you note, teaching young athletes safer and fundamentally sound tackling techniques is vitally important. However, Heads Up Tackling® is but one of several important components of Heads Up Football – a program created and administered by USA Football.

In addition, since it's publishing of the Jan. 13, 2014, story about Heads Up Football, ESPN has become one of USA Football's most significant endorsers, providing generous financial and promotional support for our work. ESPN announced its financial support of USA Football (story can be found here: http://www.espnfrontrow.com/2014/10/espn-usa-football-team-advance-youth-player-safety/) during its Oct. 27, 2014, *Monday Night Football* telecast. ESPN's financial gift to our nonprofit office will enable high schools spanning 28 states to enroll into our Heads Up Football program in 2015. We are proud to have ESPN's generous support and trust.

Relative to player safety research, USA Football in 2012 began commissioning an annual youth tackle football player safety surveillance study encompassing more than 4,000 young athletes across multiple states to gain knowledge about the level of safety at our sport's grassroots and leverages this science for the good of young athletes. This independent scientific study, conducted by the Datalys Center for Sports Injury Research and Prevention, is believed to be the first of its scope in youth football's 80-plus year history.

b. How does the safety of tackle football compare with flag football for children under 14?

No scientific study for flag football paralleling our youth tackle football player safety surveillance study has been conducted to our knowledge. USA Football would welcome this research or grant funding that would enable our nonprofit office to expand the youth tackle football player safety surveillance study to investigate the rates of injury in flag football.

c. Has "Heads Up Tackling" reduced injuries among youth players? If so, please provide statistics and documentation supporting that conclusion. If not, please explain why not.

USA Football will have its initial year of data in the first quarter of 2015 that analyzes the level of safety in youth football organizations that participate in our Heads Up Football program versus those that do not.

d. In 2013, over 25% of youth leagues nationwide registered for your Heads Up Football program. Generally, why did nearly 75% of leagues not register, and how do you plan to increase the share of those who do?

Heads Up Football was first offered on a national scale to youth leagues in 2013. Reaching a registration figure of 25 percent in year one marked an encouraging and significant start in changing behavior for the better, particularly when considering that USA Football does not possess mandating authority with youth football

Scott Hallenbeck, Executive Director, USA Football, January 9, 2015

organizations. Prior to 2013, there was no national coaching education and player safety program endorsed by leaders in medicine or sport for youth football organizations to employ nationwide. The programs and resources that we create and offer to the high school and youth football community are put into practice as a value proposition. In 2014, more than 50 percent of our nation's youth football leagues registered for Heads up Football as did more than 750 high schools across 44 states.

There is more work to be done and we are inspired to continue to do it in partnership with medical and sport experts through education-based outreach such as free events, public service announcements and educational campaigns. Our hope is that all high school and youth football programs participate in Heads Up Football for the good of their young athletes.

# # #

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ONE HUNDRED THIRTEENTH CONGRESS

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December 19, 2014

Mr. Richard Cleland
Assistant Director
Division of Advertising Practices
Bureau of Consumer Protection
Federal Trade Commission
601 New Jersey Avenue, N.W.
Washington, D.C. 20580

Dear Mr. Cleland,

Thank you for appearing before the Subcommittee on Commerce, Manufacturing, and Trade on Thursday, March 13, 2014 to testify at the hearing entitled "Improving Sports Safety: A Multifaceted Approach."

Pursuant to the Rules of the Committee on Energy and Commerce, the hearing record remains open for ten business days to permit Members to submit additional questions for the record, which are attached. The format of your responses to these questions should be as follows: (1) the name of the Member whose question you are addressing, (2) the complete text of the question you are addressing in bold, and (3) your answer to that question in plain text.

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Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,

Lee Terry
Chairman
Subcommittee on Commerce,
Manufacturing, and Trade

cc: Jan Schakowsky, Ranking Member, Subcommittee on Commerce, Manufacturing, and Trade
Attachment

Subcommittee on Commerce, Manufacturing, and Trade
March 13, 2014
Improving Sports Safety: A Multifaceted Approach
Questions For The Record Response
Mr. Richard Cleland, Federal Trade Commission

The Honorable Lee Terry

1. How do products come to your attention for scrutiny of advertising or safety claims?

Products come to our attention through numerous means. In some instances – as was the case with the claims made by the major football helmet manufacturers – a Senator or Member of Congress asks the Commission to look into a particular issue. Issues that are discussed in general media (*e.g.*, newspapers), trade journals, or social media can also alert us to potentially questionable claims. In addition, we occasionally receive referrals from advertising self-regulatory bodies (*e.g.*, the National Advertising Division of the Council of Better Business Bureaus), and we have open lines of communication with staff at other federal agencies whose missions include consumer protection (*e.g.*, the Food and Drug Administration and the Consumer Products Safety Commission). We also receive complaints from businesses about their competitors' advertising claims, as well as complaints from consumers. Finally, agency staff members read and watch advertising with an eye out for potentially problematic claims.

2. You stated during your testimony that the Federal Trade Commission believes it is essential for safety claims to be truthful and substantiated. How do you determine or measure such claims?

The first step is to determine the messages an ad is likely to convey to consumers, which the Commission does by considering the "net impression" conveyed by all elements of the ad.

An advertiser must have a reasonable basis for all objective claims reasonably conveyed by its advertising at the time it makes those claims. To determine what evidence will be sufficient to support a particular claim, the Commission generally considers the following factors: (1) the type of product, (2) the type of claim, (3) the benefits of a truthful claim, (4) the

ease of developing substantiation, (5) the consequences of a false claim, and (6) the amount of substantiation experts in the field would agree is reasonable.[1]

Applying these factors, the Commission generally requires advertisers to have competent and reliable scientific evidence to substantiate claims involving health or safety. Moreover, if the advertiser represents that it has a particular level of substantiation for its claims – for example, the advertisement says that "clinical studies prove" the product provides a specific benefit – the advertiser must have at least the level of substantiation specified in the advertisement, and the clinical studies in that case must be properly designed and conducted, and the results properly analyzed.

3. The FTC requires that advertisers "have a reasonable basis for all objective claims[.]" What is reasonable? How would you explain this to parents so they understand how much trust than put in safety claims?

As noted above, what qualifies as a "reasonable basis" for a particular claim is case-specific. When competent and reliable scientific evidence is required, the Commission considers the quality and quantity of evidence generally accepted in the relevant scientific field to substantiate that a claim is true. For example, a claim that a product prevents cancer would need more rigorous substantiation than a claim that a product boosts metabolism.

We cannot realistically expect parents to critically assess concussion protection claims made for football helmets or other athletic headgear. In most cases, the advertiser's purported substantiation will not be readily accessible, and even if it was available, few consumers would be able to meaningfully evaluate that evidence – that is, to determine whether the testing done on the product was appropriate, properly conducted, and correctly analyzed. That being the case,

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[1] *Pfizer, Inc.*, 81 F.T.C. 23 (1972); *see also* FTC Policy Statement Regarding Advertising Substantiation, appended to *Thompson Medical Co.*, 104 F.T.C. 648, 839 (1984), *aff'd*, 791 F.2d 189 (D.C. Cir. 1986).

we believe that the most important messages to parents are: (1) no product currently on the market has been shown to prevent concussions; (2) improvements in impact absorption (as measured by drop tests) do not necessarily result in corresponding or proportional reductions in concussion risk;[2] and (3) to date, the weight of scientific evidence does not show that mouthguards are effective in reducing the risk of concussions, although they do help protect against dental injuries.

We would also suggest to parents that although there does not appear to be any football helmet that can prevent concussions or any test method developed to date that can fully assess the impact of both direct and rotational forces, some helmets may provide better protection than others; parents can look to independent, third-party researchers who have no financial interest in any particular brand of helmet as a potential source of useful information.

4. After the Brain-Pad settlement, the FTC sent several letters to other sports safety equipment manufacturers. How many changed their behavior right away?

Nearly all of the 18 sports equipment manufacturers who received warning letters immediately after the announcement of the Brain-Pad settlement responded positively to those letters by changing their websites and/or packaging. In most cases, there was some initial exchange concerning what representations were allowed and the type of science required to support those representations. In some cases, staff engaged in a series of conversations with company representatives before the problematic claims were resolved.

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[2] Less impact on the brain is certainly better than more impact, but the staff's understanding is that researchers have not identified a specific correlation between a reduction in impact as measured by standard drop tests and a corresponding reduction in concussion risk.

5. In the case of football helmets by the three major manufacturers, you stated that the manufacturers "discontinued potentially deceptive claims" by the time the FTC closed the investigations. Can you explain what these potentially deceptive claims were and if they were deceptive because there was insufficient substantiation?

The staff's investigation of Riddell Sports Group, Inc.'s advertising focused on claims that research proved that Riddell Revolution® varsity and youth football helmets reduced the risk of concussion by 31% compared to "traditional" helmets. Riddell cited the results of a study published in the journal *Neurosurgery* that compared the concussion rates over three years between high school football teams that received new Revolution® helmets and teams that wore "traditional" helmets from their schools' existing stock as substantiation for these claims.[3] FTC staff concluded that this study did not substantiate Riddell's advertising claim, given two "significant limitations" identified by the study's authors and discussed in detail in the Commission's March 13, 2014 Prepared Statement, "Improving Sports Safety: A Multifaceted Approach."

With respect to both Xenith, LLC and Schutt Sports, Inc., the staff investigated whether those companies had disseminated unsubstantiated claims that the companies' helmets reduced concussion risks. Xenith's advertising had included references to the results of player surveys and statements about reductions in the occurrence of concussive episodes; Schutt's advertising had, among other things, showed the company's helmets performing better than competing helmets in impact absorption tests.

However, it must be noted that all three investigations were closed by the staff without formal Commission action, and no agency determination was made as to whether the claims at issue violated the FTC Act.

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[3] M. Collins, et al., "Examining Concussion Rates and Return to Play in High School Football Players Wearing Newer Helmet Technology: A Three Year Prospective Cohort Study," 58 Neurosurgery 275 (Feb. 2006).

FRED UPTON, MICHIGAN
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December 19, 2014

Dr. James Robert Graham
Chairman
Committee on Sports Related
Concussions in Youth
Institute of Medicine
5049 Wornall Road, Suite 7E
Kansas City, MO 64112

Dear Dr. Graham,

Thank you for appearing before the Subcommittee on Commerce, Manufacturing, and Trade on Thursday, March 13, 2014 to testify at the hearing entitled "Improving Sports Safety: A Multifaceted Approach."

Pursuant to the Rules of the Committee on Energy and Commerce, the hearing record remains open for ten business days to permit Members to submit additional questions for the record, which are attached. The format of your responses to these questions should be as follows: (1) the name of the Member whose question you are addressing, (2) the complete text of the question you are addressing in bold, and (3) your answer to that question in plain text.

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Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,

Lee Terry
Chairman
Subcommittee on Commerce,
Manufacturing, and Trade

cc: Jan Schakowsky, Ranking Member, Subcommittee on Commerce, Manufacturing, and Trade
Attachment

Robert Graham, M.D.
Director, Aligning Forces for Quality
National Program Office
The George Washington University
and
Former Chair, Committee on Sports-Related Concussions in Youth
Board on Children, Youth, and Families
Institute of Medicine-National Research Council
The National Academies

January 7, 2015

Additional Questions for the Record

The Honorable Lee Terry

1. **You mentioned that little research has been done on the frequency of concussions in athletes younger than high school. How would you propose a study collecting this information?**

Partially in response to the finding that there are a lack of data on the occurrence of concussions in pre-high-school-age youth, the committee recommended that the Centers for Disease Control and Prevention, taking account of existing surveillance systems and relevant federal data collection efforts, establish and oversee a national surveillance system to accurately determine the incidence of sports-related concussions, including those in youth ages 5 to 21 (see recommendation 1, p. 286). The recommendation goes on to describe the types of data that should be collected as part of this surveillance system, but the committee did not comment specifically on *how* these data should be collected. The committee is not able to provide this type of guidance at this point because it has disbanded. In keeping with the committee's suggestion that existing surveillance systems and data collection efforts be taken into account, it may be worth hearing from individuals who have been involved with research on concussions in younger populations of youth about what has and has not been effective in terms of study design and data collection. Two such efforts that are briefly mentioned in the committee's report (see top of page 37) were a 2011-2012 Middle School RIO study that collected injury data from a national sample of middle school and Pop Warner football players (Middle School RIO™, 2013) and a 2-year USA Football study (2012 and 2013 seasons) of 10 youth football leagues in six states (USA Football, 2013). The data were collected by the Datalys Center for Sports Injury Research and Prevention (http://datalyscenter.org/). Additional studies may now be underway.

2. **The Committee on Sports Related Concussions in Youth recommends that NIH and DOD support research to establish metrics and markers of concussion diagnosis, prognosis, and recovery in youth. What are your ideal metrics and markers?**

   Given the absence of a diagnostic test or biomarker for concussion, diagnosis of concussion and monitoring of recovery is based largely on symptoms (physical, cognitive, emotional, sleep-related) reported by the individual. The diagnosis and management of concussion may be complicated if athletes misreport their symptoms. A further drawback to relying primarily on symptom reporting to identify concussion is that symptoms may not become apparent for hours or even days after injury. The use of multiple evaluation tools (e.g., combining symptom scales and checklists, balance testing, and neurocognitive testing) may increase the sensitivity and specificity of concussion identification, although at the time of the committee's report, evidence was insufficient to determine the best combination of measures. In addition, as is described in the report, studies of the effectiveness of neurocognitive tests to predict diagnosis and track recovery have had mixed results, and an individual's performance on these tests may be influenced by many factors. In response to these findings, the committee recommended that NIH and DOD support research to establish objective, sensitive, and specific metrics and markers of concussion diagnosis, prognosis, and recovery (see Recommendation 2, p. 287). The committee did not, and cannot at this time, suggest what these metrics and markers should be, but the report discusses advanced imaging techniques and serum biomarkers as tools that may be used in the future to aid in concussion diagnosis and management. Newer imaging techniques (e.g., magnetic resonance spectroscopy, positron emission tomography, functional magnetic resonance imaging, diffusion tensor imaging) had not yet been validated for clinical use at the time of the committee's report, although this is an ongoing area of study. Similarly, appropriately sensitive and specific serum biomarkers could be of great diagnostic and prognostic value in the future, but there was no evidence to support their use at the time of the committee's report. With respect to neurocognitive tests, the committee found that additional research is needed to provide more accurate and valid information about the relation of test scores to impairment following concussion.

3. **You stated that "[c]urrent testing standards and rating systems for protective equipment do not incorporate measures of rotational head acceleration or velocity and therefore do not comprehensively evaluate a particular device's ability to mitigate concussion risk."**

   a. **Does this imply that current helmet testing standards should not be relied upon in evaluating equipment choice?**

      At the time of the committee's report, helmet testing standards did not incorporate a measure of rotational acceleration, nor did they include a protocol to probe the ability of a helmet to mitigate rotational forces that have been shown to cause concussions. Due to the decoupling of linear and

rotational acceleration under certain impact conditions that occur in sports, a reduction in linear acceleration alone does not necessarily translate into a reduced concussion risk. The committee therefore found that current testing standards do not comprehensively evaluate a particular device's ability to mitigate concussion risk. Current testing standards do evaluate a helmet's ability to mitigate skull fracture and other serious head injuries and thus may be used in choosing a helmet.

b. Is there an effective test for rotational head acceleration?

As is noted in the committee's report (p. 250), NOCSAE has research underway to develop a test protocol incorporating both linear and rotational loading modes. Following the release of the committee's report, NOCSAE issued a proposed helmet testing standard that has a new testing method and a threshold of rotational acceleration below which all helmets must perform. The proposed standard will be open for comment until June 2015. At that time, if there are no revisions, NOCSAE's board is expected to vote to finalize the standard and require implementation by manufacturers by June 2016 (http://nocsae.org/wp-content/uploads/2011/10/NOCSAE-June-Board-Meeting-release-FINAL-6-20-14.pdf). Because the committee is now disbanded, it cannot comment on the appropriateness of NOCSAE's proposed testing method or the threshold of rotational acceleration that will be used.

The Virginia Tech STAR evaluation system for helmets has been expanded to include hockey helmets. In this expansion, measures of rotational acceleration have been incorporated into the injury risk assessment. The researchers who developed the STAR evaluation system may be able to provide additional information on the testing methods and criteria.

c. What improvements would you recommend in order to improve the adequacy of the current testing standards and rating systems?

As described in the committee's report (p. 250), advances in helmet testing standards that incorporate new methods and new injury criteria that evaluate protection in both linear and rotational loading modes are needed. Injury criteria for concussion may vary by age and other factors, and injury criteria for youth remain elusive. As the report points out, we need to know what levels of linear and rotational acceleration helmets need to be below in order to minimize the risk of concussion in youth.

FRED UPTON, MICHIGAN
CHAIRMAN

HENRY A. WAXMAN, CALIFORNIA
RANKING MEMBER

ONE HUNDRED THIRTEENTH CONGRESS

Congress of the United States

House of Representatives

COMMITTEE ON ENERGY AND COMMERCE

2125 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, DC 20515–6115
Majority (202) 225–2927
Minority (202) 225–3641

December 19, 2014

Dr. James M. Johnston, Jr.
Assistant Professor of Surgery
Department of Neurosurgery
Children's Hospital of Alabama
University of Alabama-Birmingham
1600 7th Street South, Suite JFL 400
Birmingham, AL 35233

Dear Dr. Johnston,

Thank you for appearing before the Subcommittee on Commerce, Manufacturing, and Trade on Thursday, March 13, 2014 to testify at the hearing entitled "Improving Sports Safety: A Multifaceted Approach."

Pursuant to the Rules of the Committee on Energy and Commerce, the hearing record remains open for ten business days to permit Members to submit additional questions for the record, which are attached. The format of your responses to these questions should be as follows: (1) the name of the Member whose question you are addressing, (2) the complete text of the question you are addressing in bold, and (3) your answer to that question in plain text.

To facilitate the printing of the hearing record, please respond to these questions by the close of business on Monday, January 5, 2015. Your responses should be e-mailed to the Legislative Clerk in Word format at **Kirby.Howard@mail.house.gov** and mailed to Kirby Howard, Legislative Clerk, Committee on Energy and Commerce, 2125 Rayburn House Office Building, Washington, D.C. 20515.

Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,

Lee Terry
Chairman
Subcommittee on Commerce,
Manufacturing, and Trade

cc: Jan Schakowsky, Ranking Member, Subcommittee on Commerce, Manufacturing, and Trade
Attachment

Response of Dr. James M. Johnston, Jr.

Additional Questions for the Record

The Honorable Lee Terry

1. You described the Sports Concussion Assessment Tool as part of an examination of an athlete. How accurate is an evaluation of an athlete? Is an evaluation standardized or is there interpretation based on the differences of each individual athlete? How can evaluations be improved?

   The Sports Concussion Assessment Tool Version 2 (and now 3) is a standardized method for evaluating athletes suspected of having a concussion. Each subcomponent of the test (Glasgow Coma Scale (GCS), Maddocks score, physical signs score, coordination score, symptom assessment-Post Concussion Symptom Score (PCSS), Standardized Assessment of Concussion (SAC), and balance examination have shown both reliability and validity in the assessment of concussion (see attached document, Guskiewicz et al). In addition, more recent studies have generated normative data for the SCAT for ages above 12, and the Child-SCAT3 has been introduced and validated for children aged 5-12. It is clear that the SCAT2/SCAT3 represents an important component of the comprehensive evaluation of an athlete suspected of suffering concussion, and streamlines the evaluation process ensuring reliable and useful data for decision making regarding return to play and other interventions. Current studies are underway evaluating the efficacy of other sideline assessments of concussion including the King-Devick Test, reaction time tests, pupillometry and even serum biomarker tests. Whether these tests add significant value to existing concussion assessment protocol will be more clear after larger studies are complete.

2. During your testimony you mentioned that recent studies have identified "potential long term health consequences" that are "associated with repeated head impacts." In medical or research terms, what is the meaning of "associated" regarding how strong the relationship is?

   a. Does that indicate more research is needed? If so, please explain what research is needed and how it could improve overall safety of sports.

   Recent studies have clearly demonstrated significantly higher rates of neuropathology (including depression, dementia, parkinsonian symptoms, and ALS) in professional athletes who have played impact sports (football, hockey) compared to the general population. Dementia pugilistica was first described in boxers more than 80 years ago and is thought to be identical to chronic traumatic encephalopathy (CTE), more recently described in professional, collegiate (and now high school) football players. With the addition of new imaging (PET and MRI) data demonstrating changes in white matter and deep cortical structures in living football players, the evidence has become increasingly strong suggesting a causal relationship between repeated head impacts and long term neurological consequences in professional athletes who have played for many years. More research is needed to determine the prevalence of these injuries in the general population, thresholds for injury in athletes, effects of subconcussive impacts on children, the biomechanics of concussion and design of better helmets, etc. Though we do not have a complete understanding of all of these questions, it has become increasingly clear that repeated head trauma is not beneficial to the developing or mature brain.

3. What is rotational loading? Why is that important? Can a helmet or piece of equipment reduce rotational loading?

Response of Dr. James M. Johnston, Jr.

Rotational loading refers to the stress and strain in brain tissue that occur as a result of twisting of the head around the neck in three dimensional space. In comparison with a linear impact (ie one helmet striking the side of another helmet and translating the head in a straight line direction with resultant injury to the brain), rotational loading results in a shear type injury pattern that can damage deep grey and white matter structures as well the brainstem. Both linear and rotational loading are thought to contribute to the pathophysiology of both concussive and subconcussive impacts. Currently, there is no helmet or equipment available that is expressly designed or proven to reduce rotational loading. Fortunately, new standards for helmet testing have been proposed by both NOCSAE and Virginia Tech (STAR system) that will include a rotational component in the testing paradigm. Based on experience from the transportation industry, after the advent of these new standards, helmet manufacturers will reorient their design capabilities and manufacture improved helmets that address and mitigate rotational loading.

The Honorable Joe Barton

1. The ISO/IEC and ASNI specify that accredited standards must identify normative references that support specific provisions of a standard. In your prepared remarks and in your testimony, you stated that NOCSAE standards should be overhauled in order "to reflect current understanding of concussion pathophysiology and foster improved helmet design."

2. What specific concussion pathophysiology should be included in helmet standards, and how should that pathophysiology be described for purposes of testing and validation?

   Current helmet standards (NOCSAE, Snell, and DOT) all include testing paradigms that assess protection from linear impact only. New helmet standards will need to include additional tests that also assess a helmet's ability to protect users from tangential impacts that result in rotational acceleration/loading. As mentioned above, rotational loading is known to be a significant contributor to brain injury and concussion, resulting in significant shear type injury to deep brain structures. Fortunately, both NOCSAE and Virginia Tech STAR testing paradigms will include both linear and rotational testing as part of their updated format later this year.

3. Panel experts, including you, seemed to agree that there is no scientific consensus for a concussion specific injury threshold, and that much more research and data collection is needed in that area. Without scientific consensus for a concussion specific threshold for either linear or rotational accelerations, how can those be incorporated into a helmet standard?

   Though current accelerometer-based studies have not found a distinct "threshold" for concussion diagnosis, it has become clear that concussion may be observed after a wide range of impact magnitudes, and involves both linear and rotational acceleration components. Of more concern, recent research has broadened the scope from "concussive" impacts to the concept of "subconcussive" impacts or impact exposure over time. Studies of athletes using advanced MR imaging and neuropsychological testing have demonstrated that structural changes and decreased neurocognitive function are proportional to the number of impacts, even in the absence of concussion. Thus, it becomes more clear that decreasing impact exposure, from both high magnitude (>80G) concussive and lower magnitude (20-80G) subconcussive impacts, is a necessary criterion for new helmet design standards. Again, based on the experience of the automotive/transportation industry, new standards should initially be based on a consensus agreement of "acceptable" protection from the known range of impact conditions, which

typically reflects the higher range of existing helmet performance (ie 4 and 5 star rated helmets in the Virginia Tech STAR system). Over time, as helmet design improves and more data is generated detailing impact conditions and biomechanics of injury, this bar is slowly raised to reflect higher expectations of safety, thus improving helmet design and performance by manufacturers in order to remain competitive in the marketplace. This iterative process generated by transportation safety standards and star ratings is why cars sold today are so much safer than those sold 20 years ago. In stark contrast, the helmet industry has had no comparable change in standards since the introduction of the NOCSAE paradigm since 1973. It is not hard to imagine how different (and safer) our current helmet technology might be now if this standard had evolved and become more demanding at the same rate as those of the automotive industry over that same period.

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December 19, 2014

Mr. Gerard Gioia, Ph.D.
Director
Safe Concussion Outcome Recovery
& Education Program
Children's National Medical Center
111 Michigan Avenue, N.W.
Washington, D.C. 20010

Dear Dr. Gioia,

Thank you for appearing before the Subcommittee on Commerce, Manufacturing, and Trade on Thursday, March 13, 2014 to testify at the hearing entitled "Improving Sports Safety: A Multifaceted Approach."

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Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

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Lee Terry
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