



## H.2007 Opposition Letter

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Date: October 21, 2019

To: The Honorable Senator Joanne M. Comerford, Chair  
Massachusetts Joint Committee on Public Health

The Honorable Senator Nick Collins, Vice-Chair  
Massachusetts Joint Committee on Public Health

The Honorable House Member John J. Mahoney, Chair  
Massachusetts Joint Committee on Public Health

The Honorable House Member Chynah Tyler, Vice-Chair  
Massachusetts Joint Committee on Public Health

Cc: The Honorable House Member Paul A. Schmid III, Commonwealth of Massachusetts  
The Honorable House Member Bradley H. Jones Jr., Commonwealth of Massachusetts  
The Honorable Assemblymember Jim Cooper, State of California  
California Youth Football Alliance, Medical Advisory Committee  
Massachusetts Youth Football Alliance

Via: Email

Re: Opposition to H.2007 - An Act for No Organized Head Impacts to School Children

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The California Youth Football Alliance (CAYFA) is a National Youth Football Non-Profit Organization comprised of players, parents, coaches, game officials, league administrators, and citizens who are in opposition of H.2007. We submit this letter with three specific intentions:

1. Undeniable opposition to H.2007
2. Proposal to enact a Massachusetts Youth Football Act based on legal precedent at the state level, and current industry best practices
3. Submit research that refutes scientific claims made by those supportive of H.2007

### **Undeniable Opposition to H.2007**

An outright ban of youth tackle football until 8<sup>th</sup> grade is an extreme and unhealthy legislative measure, in which we believe the authors failed to consider several key aspects before submitting this bill for consideration:

1. The proposed legislation in H.2007 to ban youth tackle football is an unnecessary and ineffective example of interference in parental rights. Our children deserve the very best environment that affords the benefits of all youth sports, in this case tackle football, while minimizing risk. We invite the authors to join us to co-create the optimal solution for the children of Massachusetts backed by objective, trusted, and unbiased science.
2. H.2007 unjustifiably targets with extreme prejudice, the sport of youth tackle football and does so in a single sport discriminatory fashion while other contact sports and activities which have been scientifically proven to pose a greater potential for injury risk remain intact and proportionally unaffected.



## H.2007 Opposition Letter

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3. Improvements in instructional techniques and coaching certifications that minimize risk in blocking, defeating the block, and tackling techniques, combined with health and safety training, coupled with improvements in protective equipment technology, have put youth tackle football on a continuously improving path making youth tackle football safer today than it has ever been.
4. The social, emotional, intellectual, and physical benefits received by youth participating in youth tackle football far outweigh the minimal risk of potential injury; denying youth access to such positive influences during a young athlete's formative years of emotional and social development would be an injustice to the very children who this proposed legislation purports to serve.
5. Youth tackle football embodies diversity and inclusiveness, in that it levels all demographic boundaries (e.g. economic, ethnic, racial, religious, etc) and brings communities together like no other sport or activity.
6. Participation in youth tackle football has immeasurable positive effects on the lives of hundreds of thousands of youth athletes throughout Massachusetts and our country who are underserved by traditional social, academic, and family units by providing positive mentoring relationships and stability.
7. Youth tackle football has a long and proud history spanning nearly 75 years of organized play with a significant portion of that time being played under less stringent safety guidelines as present today. If indeed there were such prevailing risk of injury (e.g. neurological exposure to our youth), there would be an overwhelming and visible public health crisis; it is clear that is not the case regionally, statewide, or even at the national level.

The sponsors of H.2007, including but not limited to the Concussion Legacy Foundation, are attempting to regulate a commercial business model that bans youth tackle football and retains flag football as the exclusive football alternative. We make this statement for two reasons. First, due to the language of H.2007. Second, because we faced a similar threat in California in 2018, where we engaged with the state legislature, Chris Nowinski, and others who oppose youth tackle football in face to face and telephone discussions regarding the banning of youth tackle football. These anti-tackle football stakeholders shared their perspective of the game, science, and business desires with us. In the debate regarding tackle football, we experienced two sides of the discussion: (1) Ban the Sport, or (2) Leave it Alone.

We founded the CAYFA to provide a third option: to accelerate the transformation of youth tackle football in a medically informed manner. In doing so, we have achieved the following in less than 12 months as a 100% volunteer organization:

1. Sponsored the California Youth Football Act which was signed into California law by Governor Gavin Newsom on July 31, 2019.
2. Launched a Medical Advisory Committee to guide a nation-wide relentless journey of improvement with medical insight.

### **Proposal to Enact a Massachusetts Youth Football Act**

We urge the Massachusetts legislature to use the California Youth Football Act as a precedent and the role model template for legislative actions. The CAYFA applauds the Massachusetts youth tackle football community's intentions and efforts to improve the level of safety in the game of tackle football. **With the author of the California Youth Football Act, Assemblymember Jim Cooper (D-Elk Grove), and our in-state partners, the Massachusetts Youth Football Alliance, we are writing to offer our professional experience and time to assist with the crafting of a youth tackle football safety bill for Massachusetts.** In doing so, we would unify the youth tackle football community from our respective states and the nation. We propose to co-create the Massachusetts Youth Football Act with input from deeply engaged, well informed, and intentioned medical professionals, players,



## H.2007 Opposition Letter

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parents, coaches, game officials, league administrators, public officials, and citizens, who want to save youth football and continue improving the safety of the sport. The Massachusetts Youth Football Act would build on existing efforts and state law by proposing a comprehensive set of tackle football safety standards, tailored for the Massachusetts youth community, backed by pioneering new practices that enhance current local and national level requirements.

The Massachusetts Youth Football Act could contain some, all, or more impacts like those shared below:

1. Provide **the first common safety standards that apply to all youth tackle football teams and leagues in Massachusetts, regardless of their national (e.g. Pop Warner, AYF, etc.) or independent affiliation**, thereby creating the first Massachusetts Youth Tackle Football standard, and second such standard in the country.
2. Implement standards for every team, program, association, and/or chapter that represents **the most comprehensive and stringent set of leading practices from across the health & safety and football industries**:
  - a. **Full contact limited to 30 minutes, twice a week**, exceeds all previous youth tackle football guidelines in the nation.
  - b. **Annual concussion and head injury education for all youth tackle football stakeholders** (parents, coaches, administrators, and referees) enables the entire youth tackle football community to operate with the same baseline of education and demystifies the current confusion facilitated by the media narrative.
  - c. **Annual blocking and tackling certification that minimizes the head in play for all youth tackle football coaches** provides the broadest coverage for ongoing coaching development and technique instruction enabling our children to get the very best training.
  - d. **Annual First Aid, CPR, and AED certification for all youth tackle football coaches** enables any coach to provide first responder care in their practice facilities, games, and communities.
  - e. **Annual heat acclimation education for youth tackle football parents, coaches, and administrators** enables the youth tackle football community to prepare for hot conditions and create a safer on-field environment.
  - f. **Mandatory medical personnel present at all youth tackle football games** ensures highly qualified personnel are present to provide the necessary duty of care for youth tackle football players, the cheerleaders, and their fans.
  - g. **An independent supervisor to monitor all practices** with authority to remove players for injury enables a third-party objective pair of eyes on our youth tackle football players as an added layer of risk management. This supervisor will have the same level of education and training as the coaches.



## H.2007 Opposition Letter

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- h. **Injury reporting and tracking requirements for all teams, leagues, and tournaments**, enables shared monitoring of player performance, safety, and return to play requirements while gathering data to continue informing future advancements in the sport with medical research.
  - i. **Minimum of 10 hours of non-contact practice before any contact** provides a smoother transition into full contact as well as duty of care for heat acclimation considerations.
  - j. **Inter-season equipment reconditioning** based on industry standards enables quality equipment to be provided to our youth tackle football players.
  - k. **Intra-season equipment inspections** at every practice and/or game provides real-time assurance that the equipment is appropriate for play.
  - l. **Public declaration of compliance with the Massachusetts Youth Football Act by each youth tackle football entity** provides freely available confirmation that a team, program, association, and/or league are committed to and in compliance with AB-1. This permits the youth leagues to self-disclose their commitment to safety compliance and avoids unnecessary oversight.
3. Implement standards for leagues, and tournaments, that enhances current leading practices from the health & safety as well as football industries:
    - a. **Mandating subdivisions** organized by relative age, and, or weight
    - b. **Injury record keeping** for all teams and players in the league and/or tournament
  4. Accelerate the safety standards in Massachusetts and **serve as a role model for other states** who are seeking to address their tackle football evolution.

### **Research that Refutes Scientific Claims Made by Those Supportive of H.2007**

In public statements leading up to your hearing on October 22, 2019, the authors of the H.2007 have stated the proposal to ban youth tackle football until 8<sup>th</sup> grade is based on current scientific research the links participation in youth tackle football before the age of 14 with long-term neurological damage; however, the research cited by the bill's proponents is by no means conclusive, nor has the research received universal acceptance in the medical community via peer reviewed, control-group tested research studies.

The CAYFA continues to research and uncover leading medical insight, with support from our Medical Advisory Committee, that impacts the youth tackle football community. Our scientific understanding of the brain is rapidly evolving with respect to head impacts and concussions. There is no way to eliminate head impacts or concussions due to general life conditions and the biological makeup of the human body. Further, the science of the brain is subject to significant debate in the media. Media outlets with misleading reports have unintended and negative consequences on society. Our society needs better and more complete education regarding concussions and CTE. The medical community has called for balance from the medical, scientific, and media communities when reporting on issues related to CTE.

In April of 2018, we published our first summary of medical research and statements from world-class scientists, including neurologists, regarding the science of the brain with respect to tackle football. We are submitting in this letter an updated comprehensive list of 30+ sources of medical insight to reflect the most current perspective on



## H.2007 Opposition Letter

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the evolving science of the brain, as it relates to participation in youth tackle football and legislative considerations.

### 1) American Academy of Pediatrics (October 25, 2015) - Tackling in Youth Football

Researchers with the American Academy of Pediatrics noted "the effect of sub concussive blows on long-term cognitive function, incidence of CTE, and other health outcomes remains unclear....Further research is needed in this area." By "delaying the age at which tackling is introduced to the game would likely decrease the risk of these injuries for the age levels at which tackling would be prohibited. Once tackling is introduced, however, athletes who have no previous experience with tackling would be exposed to collisions for the first time at an age at which speeds are faster, collision forces are greater and injury risk is higher. Lack of experience with tackling and being tackled may lead to an increase in the number and severity of injuries once tackling is introduced."

### 2) Neurosurg Focus (Feb 2016) - The science and questions surrounding chronic traumatic encephalopathy (Vin Shen Ban, et al)

Researches examined existing research on the topic of sports-related CTE and identified multiples areas of concern regarding the research methodologies utilized to identify CTE. First, researchers noted "A common misconception is that the presence of tau protein in the brain leads to a diagnosis of chronic traumatic encephalopathy (CTE)." They further discovered that "In the published autopsy cases of athletes suspected to have had CTE over the past 11 years, only (20%) "[of] individuals were found to have the neuropathological findings fitting the individual authors' criteria of CTE with no coexisting neuropathology....and the high number of athletes included in the previous studies represents selection bias."

The researchers further concluded that of the "approximately 18,000 former NFL players" and "approximately 3 to 4 million athletes (at all levels) [who] play football every year, which "pale in comparison with the total number of athletes that play contact sports or sports that involve repetitive head contact (e.g., hockey, boxing, lacrosse, soccer, equestrian sports)", the historical total number of reported cases of CTE (n = 153, in the scientific literature and media) "raise[s] the critical question of the true incidence and prevalence of CTE in athletes involved in contact sports."

The researchers reference a study in BRAIN by McKee, et al (The spectrum of disease in chronic traumatic encephalopathy.) which found "that 11% of those found to have CTE by pathological examination were asymptomatic." The study concludes that "it is premature to conclude that playing contact sports will lead to CTE. The potential risks involved in playing such sports need to be balanced against the potential benefits for the individuals concerned. It is crucial to base clinical decisions on an objective review of the current evidence. Large-scale longitudinal studies are needed to further our knowledge on sports-related TBI."

### 3) British Journal of Sports Medicine (Mar 2018) - A systematic review of potential long-term effects of sport-related concussion (Geoff Manley, et al)

Researched from the Department of Neurological Surgery at University of California San Francisco conducted a systematic review of the existing literature on possible long-term effects of sport-related concussions, including risk for CTE. Following a review of 3819 studies, the researched found "former high school American football players do not appear to be at increased risk for later life neurodegenerative diseases" and while "multiple concussions appear to be a risk factor for cognitive impairment and mental health problems in some individuals. More research is needed to better understand the prevalence of



## H.2007 Opposition Letter

*chronic traumatic encephalopathy and other neurological conditions and diseases, and the extent to which they are related to concussions and/or repetitive neurotrauma sustained in sports."*

*"An increased risk for neurodegenerative diseases in retired [professional] American football players is suggested in one study examining death certificates, but more research is needed....It is important to appreciate, however, that survey studies of former collegiate and professional athletes indicate that the majority of people rate their functioning as normal and consistent with the general population. There is much more to learn about."*

*Researchers investigated the topic of sub concussive impacts and determined "there are significant methodological challenges associated with the study of sub concussive impacts. The challenge researchers face at this time is that (i) there is no established definition of a sub concussive impact or a sub concussive injury, (ii) an impact may or may not cause an injury, and it is difficult to determine if an injury has occurred, and (iii) the biomechanical features and thresholds for quantifying a impact and identifying an injury have not been agreed upon. Therefore, the hypothesis that sub concussive impacts cause long-term neurological injury requires more research before conclusions can be drawn."*

*Researchers concluded that "more research on the long-term sequelae is needed to better understand the incidence and prevalence of CTE and other neurological conditions among former athletes. The causes of mental health and cognitive problems in former athletes, like the general population, are broad and diverse including genetics, life stress, general medical problems (e.g., hypertension, diabetes and heart disease), chronic bodily pain, substance abuse, neurological conditions and disease (e.g., cerebrovascular disease) and neurodegenerative diseases (e.g., Alzheimer's disease, Parkinson's disease and ALS). The extent to which repetitive neurotrauma causes static or progressive changes in brain microstructure and physiology, and contributes to later life mental health and cognitive problems, is poorly understood and requires further study."*

**4) International Journal of Psychophysiology (Feb 2018) - Sub concussive head impact in sport: A systematic review of evidence (Lynda Mainwaring, et al)**

*Researcher reviewed a total of 1966 articles that sought to assess sub concussive impacts or outcomes related to non-concussive head impact exposure. The researchers determined "there was insufficient to weak evidence for the relationship between repetitive hits to the head and deterioration in neurocognitive performance.... Insufficient evidence was presented to determine a minimal injury threshold for repetitive hits to the head." The researches concluded that studies of male athletes in contact and collision sports identified that repetitive hits to the head are associated with microstructural and functional changes in the brain. Whether these changes represent injury is unclear.... the term 'sub concussion' to be inconsistently used, poorly defined, and misleading. Future research is needed to characterize the phenomenon in question."*

**5) The Orthopedic Journal of Sports Medicine (2017) - Youth Football Injuries: A Prospective Cohort (Andrew R. Peterson, et al)**

*Researchers at the University of Iowa studied the rate of injury in tackle football versus flag football involving a total of 3794 players from three large youth football leagues (grades 2-7). After reviewing a total of 46,416 exposures, 128 injuries were reported, with 33 injuries classified as concussions. The researchers determined "the injury rate found in the youth flag league is significantly higher than the injury rate in youth tackle football. The higher injury rate in flag football could be due to a number of factors. Flag football players do not wear protective equipment like tackle football players."*



## H.2007 Opposition Letter

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The researchers concluded that "rates of injury in youth football are relatively low. Youth flag football has a higher injury rate than tackle football. A significantly different rate of severe injury or concussion between tackle and flag football was not identified...we cannot conclude that youth flag football is a safer alternative to youth tackle football. The higher injury rate in flag football needs to be considered when determining the relative safety of flag football and tackle football. Future safety analyses should include looking at injury rates, severity, type of injury, lost time, and future consequences of injury."

**6) The American Journal of Sports Medicine (Feb 2016) - Participation in Pre-High School Football and Neurological, Neuroradiological, and Neuropsychological Findings in Later Life (Gary S. Solomon, et al)**

Researches conducted a study of forty-five (45) retired National Football League players to confirm the findings of a recent study that found a link between an earlier age of first exposure (AFE) to pre-high school tackle football (PreYOE) and long-term neurocognitive impairment. The researchers determined that "none of the neurological, neuroradiological, or neuropsychological outcome measures yielded a significant relationship with PreYOE" and long-term neurocognitive impairment. The researchers were unable "to replicate the results of the prior study, which concluded that an earlier AFE to tackle football might result in long-term neurocognitive deficits. In 45 retired NFL athletes, there were no associations between PreYOE and neuroradiological, neurological, and neuropsychological outcome measures."

**7) Developmental Neuropsychology (March 2018) - Chronic traumatic encephalopathy in sports: a historical and narrative review (Gary Solomon)**

Research from the Vanderbilt University's School of Medicine, Department of Neurological Surgery, conducted a review of current research on sport-related concussion (SRC) and chronic traumatic encephalopathy (CTE). After reviewing a study by Guskiewicz et al. (2005), which purporting to demonstrate empirically a relationship between concussions and later life cognitive impairment, the results indicated that "mental health" component scores for the NFL retirees aged 50 years and older were similar to those of the general population for all age groups. A second survey by Guskiewicz et al. focusing on memory and issues related to Mild Cognitive Impairment (MCI) demonstrated the rates of MCI in NFL retirees are essentially equal to or less than population prevalence values.

The notions that sub concussion...and repeated head impacts (RHI) are cumulative and lead to CTE have become fundamental tenets in CTE pathogenesis. Sub concussion has been defined as mild brain trauma that does not result in the readily observable signs and symptoms of a concussion. Sagher (2013) countered with: a) the definitional difficulty of sub concussive impact, b) the fact that not every incidental blow to the head is pathological, c) each impact is difficult to quantify and does not have the same significance, d) the supposition that the mere number is the rate limiting factor is "simplistic," and e) the role of genetics must be addressed.

"For purposes of cause and effect it is necessary to account for genetic, medical, psychiatric, substance abuse, and biopsychosocial variables that could be relevant in the short- and long-term neurobehavioral and neurocognitive outcomes."

The study concluded "there is no compelling empirical evidence to indicate that sport-related concussion or sub concussive impacts are the sole and direct cause of psychiatric illness, suicide, MCI, or neurodegenerative disease/CTE. As clinical neuropsychologists and sports medicine clinicians, it is incumbent on us to focus on the relevant, multivariate factors in the long-term outcome from sport-related concussion, and not to reinforce the linear thinking of concussions or sub concussive impacts as the cause



## H.2007 Opposition Letter

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of all neuropsychiatric ills. Concussions and/or sub concussive impacts are not the only independent variables in the outcome from life."

- 8) **PLOS One (January 2016) - Chronic Exposure to Androgenic-Anabolic Steroids Exacerbates Axonal Injury and Microgliosis in the CHIMERA Mouse Model of Repetitive Concussion (Dhananjay R. Namjoshi<sup>1</sup>, et al)**

Researchers at the University of British Columbia sought to identify a correlation between androgenic-anabolic steroids (AAS) use and CTE. A recent systematic review revealed that approximately 20% of all reported pathologically confirmed CTE cases have a documented history of exposure to illicit substances including androgenic-anabolic steroids (AAS), alcohol, methamphetamine and marijuana prior to or concurrent with CTE.

In the study, researchers determined AAS-treated mice exhibited significantly exacerbated axonal injury and microgliosis, indicating that AAS exposure can alter neuronal and innate immune responses to concussive TBI; however, much remains to be learned about factors other than cumulative exposure that could influence concussion pathogenesis. The researchers concluded that AAS exposure exacerbates axonal damage and neuroinflammation after concussion, which may result in a higher probability of CTE.

- 9) **Mayo Clinic Proceedings (January 2017) - High School Football and Late-Life Risk of Neurodegenerative Syndromes, 1956-1970 (Pieter H.H. Janssen, et al)**

In this community-based study, varsity high school football players from 1956 to 1970 did not have an increased risk of neurodegenerative diseases compared with athletes engaged in other varsity sports. This was from an era when there was a generally nihilistic view of concussion dangers, less protective equipment, and no prohibition of spearing (head-first tackling).

- 10) **The New York Times (January 31, 2018) - Hits to the Head May Result in Immediate Brain Damage (Gretchen Reynolds)**

The study also cannot determine whether older or younger brains respond the same way to injuries, or why some brains, in both mice and men, seem especially susceptible to mild trauma, while others, after the same hit, remain healthy. Perhaps most important, this short-term experiment cannot tell us whether brains that show incipient signs of C.T.E. will necessarily go on to develop the disease.

- 11) **StarTribune (February 10, 2018) - Does CTE call for an end to youth tackle football? (Jason Chung , et al)**

The scientific evidence linking youth casual sports play to brain injury, brain injury to CTE, and CTE to dementia is not strong. We believe that further scientific research and data are necessary for accurate risk-benefit analysis among policymakers for two reasons.

First, evidence-based science calls for research to be conducted under generally accepted principles. The case series presented by the Boston University group, primarily due to its ascertainment bias, is weaker than the evidentiary standard sufficient to demonstrate an association or causation and conflicts with pathologic findings in other studies.

CTE pathology in the brain has been shown by British pathologists to be present in approximately 12 percent of normal healthy aged people who died at an average age of 81 years (Ling et al. Acta Neuropathological).





## H.2007 Opposition Letter

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*The presence of CTE pathology in the brain on autopsy has not been shown to correlate with neurologic symptoms before death.*

*To be clear, CTE pathology could be present in a normal person.*

*There is a disconnect between the categorical rhetoric in media and news releases describing “concussion” research on the one hand, and the muddled and contentious scientific reality on the other. As noted by Dr. Goldstein’s own research, the pathology and link between head impacts and long-term neurological conditions such as CTE is still unclear, with questions of causation yet to be settled.*

*In fact, after reviewing all available evidence, the consensus statement from the international conference on concussion in sports states: “A cause-and-effect relationship has not yet been demonstrated between [CTE] and sport-related concussions or exposure to contact sports. As such, the notion that repeated concussion or sub concussive impacts cause CTE remains unknown.”*

*Nothing in Dr. Goldstein’s recent study changes this ambiguity, which brings us to our second point. Before enacting sweeping legislation or policy spurred by fears of CTE, policymakers must conduct a risk-benefit analysis based on a holistic survey of public health concerns.*

*Three recently published major studies found no increased risk for later-in-life brain diseases in men who played high school football (Jannsen et al., Mayo Clinic Proceedings; Savica et al., Mayo Clinic Proceedings, Deshpande et al., Jama Neurology).*

### 12) **The San Diego Union-Tribune (February 19, 2018) - No scientific link between youth football and CTE**

*In fact, the general consensus of the medical community is there is not a proven cause and effect of concussions and CTE. There is no definitive proof that multiple sub-concussive blows lead to CTE. Of course, that is the fear. But a link has by no means been proved.*

*Certainly, some feel even the suspicion of a link to brain trauma is enough to ban tackle football at young ages. That is not an unreasonable opinion. But that should be stated. People should not present the link of concussion to CTE as a scientific fact.*

*Or perhaps pee wee football is actually safer than high school football. Certainly, the forces involved at the younger levels are less.*

*We don’t know if it is more or less dangerous for pre-high school kids to play football versus those in high school. An argument can be made that high schoolers hit harder, and their fully developed brains are more susceptible to injury and have less recovery potential.*

*Although we don’t know the effects of concussions, we know in most other systems in the body, recovery is greater and permanent damage is less frequent in the developing body as there is still ability to grow and adapt.*

*Regardless of any law, parents should be active in making their decisions based on available facts. And lawmakers should know the facts before they vote and not just buy into a false or incomplete narrative.*

### 13) **The News & Observer (March 09, 2018) - UNC's Kevin Guskiewicz, concussion expert, would ban boxing, and maybe, punt returns | News & Observer**



## H.2007 Opposition Letter

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Guskiewicz has served on the NFL's head, neck and spine committee, and one of the recommendations was moving the kickoffs from the 30 to the 35-yard line to reduce the number of kickoff returns — the most dangerous play in football, he said.

The rule was put in place in 2011 and Guskiewicz said there were 30 percent more touchbacks and thus no returns, and a 50-percent decrease in concussions on kickoffs.

The NCAA followed suit, he said, starting possessions at the 25-yard line rather than the 20 after touchbacks. Again, there was a 50 percent reduction in concussions.

Guskiewicz, in most speaking appearances, stresses there is no "concussion crisis" affecting U.S. sports.

"That is absolutely not true," he said. "There's probably no better time to play sports, including contact sports, than right now because of how much more we know today about concussions.

Guskiewicz said the 40-percent increase in the number of concussions the past five years was a reflection of an increase in better diagnosing a concussion, combined with better treatment for it. In the past, he said, many concussions were not correctly diagnosed and treated.

"There are no more concussions occurring on our playing fields today than there was 10, 15, 20 years ago," he said.

**14) Sadler Sports - Balancing the Concussion Hype: Looking at both sides of the sensationalism (John M. Sadler)**

However, there is definitely a downside to the hysteria, according to Rance A. Boren, a Texas neurologist. "The notion that everyone who plays football going to be mentally unstable in 15 years is just not true," he said.

**15) Translational Psychiatry (Sep. 2017) - Age of first exposure to American football and long-term neuropsychiatric and cognitive outcomes (ML Alosco, et al)**

Researchers suggests that age of first exposure (AFE) to football before age 12 may have long-term clinical implications. While the study claims that athletes whose AFE is >12 year are twice as likely to have clinically impaired scores on tests for executive function (MI), behavioral regulation index (BRI), depression (CES-D), and apathy (AES); however, the researchers note that "these clinical features (executive dysfunction, behavioral dysregulation, depression and apathy) are not specific to CTE." The researchers specifically state this is "not a study of risk for CTE or of other neurodegenerative disease."

The researches further acknowledge there was "no association between AFE to football and cognition" as measured by the BTACT (Brief Test of Adult Cognition by Telephone) and the research was conducted by a "convenience sample" which "could potentially lead to bias effects, especially if AFE plays a role in selection." The findings can only be generalized to "male former football players, and the relationship between AFE to other contact sports (for example, soccer) and clinical outcomes, including female contact sports, is unknown." Additionally, researchers noted "the style of youth football play could have differed across the age groups of the sample, including differences in type and use of protective headgear.....The causal relationship between AFE to football and long-term clinical outcomes remains unclear."



## H.2007 Opposition Letter

---

The researchers further stated "The causal relationship between AFE to football and long-term clinical outcomes remains unclear...the tests examined assess symptoms that often co-occur, with bidirectional relationships (for example, depressive symptoms can affect performance on cognitive tests, cognitive impairment can also lead to symptoms of depression, depressive symptoms and impaired cognition can both be clinical manifestations of a single underlying disorder)."

The researchers specifically cautioned policy makers from using this study as the basis for policy decisions. **"Findings from the current study should not be used to inform safety and/or policy decisions in regards to youth football.** Any decisions regarding reducing or eliminating youth football must be made with the understanding of the important health and psychosocial benefits of participating in athletics and team sports during pre-adolescence. Future longitudinal studies that objectively monitor the clinical function of youth football players throughout life, including those who do not go on to play football at the high school, college or professional level, are ultimately needed to understand the long-term neurological safety implications of youth tackle football.

The researchers concluded that "Youth exposure to football may have long-term neurobehavioral consequences. Additional research studies, especially large cohort longitudinal studies, are needed to better understand the potential long-term clinical implications of youth American football to inform policy and safety decision-making."

### 16) Boston University Research: CTE Center - Frequently Asked Questions about CTE

We **believe** CTE is caused by repetitive brain trauma. This trauma includes both concussions that cause symptoms and sub concussive hits to the head that cause no symptoms. At this time the number or type of hits to the head needed to trigger degenerative changes of the brain is unknown. In addition, it is likely that other factors, such as genetics, may play a role in the development of CTE, as not everyone with a history of repeated brain trauma develops this disease. However, these other factors are not yet understood.

### 17) Written Testimony of Cynthia LaBella, MD, et al, Before the Illinois House Mental Health Committee (March 1, 2018)

While the intentions behind the legislation are well-meaning, there is **no data** to show that eliminating tackling in youth football will reduce the risk of neuropsychiatric symptoms or disorders in adolescence and adulthood and/or prevent CTE.

The significance of CTE and whether it is the cause of any symptoms while a person is still alive are as yet undetermined. Thus far there is no scientific evidence that conclusively links post-mortem findings of CTE in the brain with neuropsychological symptoms during life.

Studies show CTE is found on autopsy in approximately 12 percent of normal healthy people who died at an average of 81 years, none of whom had any neuropsychological conditions prior to death.

There is **no study** to date showing the effect of delaying the age at which tackling is introduced to football on risk of injury. Delaying the age at which tackling is introduced to the game **may** decrease injury risk for the age levels at which tackling would be prohibited. However, once tackling is introduced, athletes who have no previous experience with tackling would be exposed to collisions for the first time at an age at which speeds are faster, collision forces are greater, and injury risk is higher. Lack of experience with



## H.2007 Opposition Letter

*tackling and being tackled may lead to a substantial increase in the number and severity of injuries once tackling is introduced.*

- 18) **Head Impact Exposure in Youth Football: Elementary School Ages 9–12 Years and the Effect of Practice Structure, Annals of Biomedical Engineering Vol 41. No. 12, December 2013**

*Head impact exposure in youth football has not been well-documented, despite children under the age of 14 accounting for 70% of all football players in the United States. The objective of this study was to quantify the head impact exposure of youth football players, age 9–12, for all practices and games over the course of single season. A total of 50 players (age =  $11.0 \pm 1.1$  years) on three teams were equipped with helmet mounted accelerometer arrays, which monitored each impact players sustained during practices and games. During the season, 11,978 impacts were recorded for this age group. Players averaged  $240 \pm 147$  impacts for the season with linear and rotational 95th percentile magnitudes of  $43 \pm 7$  g and  $2034 \pm 361$  rad/s<sup>2</sup>. Overall, practice and game sessions involved similar impact frequencies and magnitudes. One of the three teams however, had substantially fewer impacts per practice and lower 95th percentile magnitudes in practices due to a concerted effort to limit contact in practices. The same team also participated in fewer practices, further reducing the number of impacts each player experienced in practice. Head impact exposures in games showed no statistical difference. While the acceleration magnitudes among 9–12 year old players tended to be lower than those reported for older players, some recorded high magnitude impacts were similar to those seen at the high school and college level. Head impact exposure in youth football may be appreciably reduced by limiting contact in practices. Further research is required to assess whether such a reduction in head impact exposure will result in a reduction in concussion incidence.*

- 19) **Primum non nocere: a call for balance when reporting on CTE, the Lancet Neurology, Volume 18, Issue 3 P231-233, March 1, 2019, William Stewart, Kieren Allinson, Safa Al-Sarraj, Corbin Bachmeier, Karen Barlow, Antonio Belli, et al.**

*As clinicians and researchers in traumatic brain injury and neurodegeneration, we are concerned by the tone of reporting on chronic traumatic encephalopathy (CTE) that has developed over the past decade, highlighted in an article in The New York Times.<sup>1</sup> Misleading reporting can have unintended, negative consequences and we call for balance from the medical and scientific communities and the media when communicating on issues related to CTE. Contrary to common perception, the clinical syndrome of CTE has not yet been fully defined,<sup>2</sup> its prevalence is unknown, and the neuropathological diagnostic criteria are no more than preliminary.<sup>3</sup> We have an incomplete understanding of the extent or distribution of pathology required to produce neurological dysfunction or to distinguish diseased from healthy tissue, with the neuropathological changes of CTE reported in apparently asymptomatic individuals.<sup>4,5</sup> Although commonly quoted, no consensus agreement has been reached on staging the severity of CTE pathology. A single focus of the pathology implicated in CTE is not yet sufficient evidence to define disease.*

*Recognizing limitations of the diagnostic process in human pathology, pathologists are careful to note that they are merely providing an opinion, thereby acknowledging that another pathologist might reasonably reach a different conclusion on the same case.<sup>6</sup> In diagnoses where the criteria for assessment and reporting are established by broad consensus, the expectation is that variance in opinion is minimised. However, at this time, while CTE diagnostic criteria are far from established, discordance in opinions on individual cases is to be expected.<sup>1</sup>*

*Unfortunately, the uncertainties around the clinical syndrome and the pathological definition of CTE are not acknowledged adequately in much of the current research literature or related media reporting, which at times has resembled science by press conference.<sup>7</sup> Too often an inaccurate impression is portrayed that CTE*



## H.2007 Opposition Letter

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*is clinically defined, its prevalence is high, and pathology evaluation is a simple positive or negative decision. This distorted reporting on CTE might have dire consequences. Specifically, individuals with potentially treatable conditions, such as depression or post-traumatic stress disorder, might make decisions on their future on the basis of a misplaced belief that their symptoms inevitably herald an untreatable, degenerative brain disease culminating in dementia.*

*We propose that the principle of, first, to do no harm, is used when communicating on CTE, whatever the platform. In particular, the many remaining uncertainties should always be acknowledged. Otherwise, the risk of doing harm is very real.*

**20) Youth Tackle Football: Perception and Reality, Pediatrics, Official Journal of the American Academy of Pediatrics, April 2019, Cynthia LaBella, MD**

*The reality is that the concussion rate in youth tackle football is lower than parents perceive (3%–5% of players per season) and is similar to concussion rates in other youth contact sports, such as soccer, ice hockey, lacrosse, and even flag football.<sup>3,5–12</sup> In contact sports, rates of overall injury and concussion increase uniformly with age and pubertal maturation status.<sup>3,5,9,12–21</sup> This is because as bodies get larger and faster, collisions occur with greater force.<sup>22,23</sup> Thus, concussion risk in tackle football is lowest when players are <12 or 13 years of age, before the pubertal growth spurt begins.*

*What about the effect of tackling and sub concussive head impacts on young developing brains, even in the absence of injury? Unfortunately, the evidence on long-term outcomes is unclear. There are few studies, and they reveal conflicting results. Alosco et al<sup>24</sup> administered telephone-based cognitive function tests and online surveys of behavioral and/or emotional symptoms to 214 former high school, collegiate, and professional football players in their 40s and 50s. Their data suggest that exposure to tackle football before 12 years of age is associated with cognitive impairment and depression later in life.<sup>24</sup> This study received widespread media coverage, which has led to significant public concern about the safety of youth tackle football. However, as is often the case with news reports on scientific studies, headlines tend to be sensationalized and key details are omitted. There are several limitations that prevent the generalization of this study's findings to the broader population of tackle football players. It was not a random sample. Volunteers were recruited through Web site postings, creating selection bias for those experiencing symptoms. Subjects were asked about events during their childhood, so recall bias may have led to inaccurate reporting. The analysis did not account for the number of previous concussions. However, the group who started football before age 12 reported significantly more concussions than those who started at age 12 or older (median of 25 vs 15, respectively). This is likely the factor driving the difference between the 2 groups. Players did not indicate how many, if any, of their concussions occurred during participation in youth football. The study did not include men who only played football at the youth level and did not go on to play in high school, college, or in a professional league. There was no comparison with a control group of male peers who had never played football. It did not account for factors such as family history, substance use, and lifestyle, which are known to influence mood disorders and cognitive function. The authors highlight these limitations as reasons why their study's findings "should not be used to inform safety and/or policy decisions in regards to youth football." They indicate that longitudinal studies are needed to understand the long-term health effects of playing youth tackle football.*

**21) Emergency Department Visits for Sports- and Recreation-Related Traumatic Brain Injuries Among Children — United States, 2010–2016, Centers for Disease Control and Prevention, Weekly, March 15, 2019, Kelly Sarmiento, MPH; Karen E. Thomas, MPH; Jill Daugherty, PhD; Dana Waltzman, PhD; Juliet K. Haarbauer-Krupa, PhD; Alexis B. Peterson, PhD; Tadesse Haileyesus, MS; Matthew J. Breiding, PhD**



## H.2007 Opposition Letter

Traumatic brain injuries (TBIs), including concussions, are at the forefront of public concern about athletic injuries sustained by children. Caused by an impact to the head or body, a TBI can lead to emotional, physiologic, and cognitive sequelae in children (1). Physiologic factors (such as a child's developing nervous system and thinner cranial bones) might place children at increased risk for TBI (2,3). A previous study demonstrated that 70% of emergency department (ED) visits for sports- and recreation-related TBIs (SRR-TBIs) were among children (4). Because surveillance data can help develop prevention efforts, CDC analyzed data from the National Electronic Injury Surveillance System–All Injury Program (NEISS-AIP)\* by examining SRR-TBI ED visits during 2010–2016. An average of 283,000 children aged <18 years sought care in EDs each year for SRR-TBIs, with overall rates leveling off in recent years. The highest rates were among males and children aged 10–14 and 15–17 years. TBIs sustained in contact sports accounted for approximately 45% of all SRR-TBI ED visits. Activities associated with the highest number of ED visits were football, bicycling, basketball, playground activities, and soccer. Limiting player-to-player contact and rule changes that reduce risk for collisions are critical to preventing TBI in contact and limited-contact sports. If a TBI does occur, effective diagnosis and management can promote positive health outcomes among children.

NEISS-AIP is operated by the U.S. Consumer Product Safety Commission and contains data on initial visits for all injuries in patients treated in U.S. hospital EDs. NEISS-AIP data are drawn from a nationally representative subsample of 66 of 100 NEISS hospitals that were selected as a stratified probability sample of hospitals in the United States and its territories; each hospital has a minimum of six beds and a 24-hour ED (5). NEISS-AIP provides data on approximately 500,000 injury-related visits each year.

For this analysis, SRR-TBIs included those TBIs among children aged <18 years that occurred during organized and unorganized SRR activities. Each case was classified into mutually exclusive SRR categories based on an algorithm that uses the consumer products involved and the description of the incident from the medical record. Persons with injuries were classified as having a TBI if the primary body part injured was the head and the principal diagnosis was concussion or internal organ injury. Type of activity (i.e., contact sport, limited-contact sport, noncontact sport, or recreation) was determined based on classifications from previous studies.† SRR-TBI cases were excluded if the injury was violence-related or if the person was dead on arrival or died in the ED. Methodology for coding and classifying data matched that of a previously published report (6). The Joinpoint Regression Program (version 4.2.0; National Cancer Institute) was used to test time trends.

The overall rate of SRR-TBI ED visits did not change significantly from 2010 (354.7 visits per 100,000 children) to 2016 (371.0); however, there were differences by sex (Table 1). Throughout the study period, the number and rate of SRR-TBI ED visits by males were higher than were those among females. The rate of SRR-TBI ED visits in males significantly increased from 2010 (486.6) to 2012 (559.1) and significantly decreased from 2012 to 2016 (482.7). However, the rate in females significantly increased from 216.5 per 100,000 children in 2010 to 254.3 in 2016. During all 7 years, children aged 10–14 and 15–17 years had higher rates of ED visits than did children in all younger age groups.

From 2010 to 2016, contact sports were associated with a higher number of TBI-related ED visits by males (99,784) than were limited contact sports (29,080), noncontact sports (44,848), and recreational activities (20,628) (Table 2). Among females, contact sports (27,180) and limited contact sports (27,343) contributed to a similar number of SRR-TBI-related ED visits. Football contributed to more ED visits (52,088) among males than did any other sport. Soccer (11,670) and playground activities (11,255) contributed to more TBI-related ED visits among females than did all other activities.

SRR-activities associated with the highest percentage of ED visits varied by age group and sex (Table 3). Football was associated with 26.8% of all SRR-TBI ED visits for males aged 0–17 years. Among males aged <5 years and 5–9 years, playground activities accounted for the most ED visits (38.2% and 19.6%, respectively).



## H.2007 Opposition Letter

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Among all females aged 0–17 years, soccer, playground activities, and basketball were the most common causes of SRR-TBI ED visits, contributing to 13.1%, 12.6%, and 11.9% of all SRR-TBI-related ED visits, respectively. Playground activities led to 42.3% of SRR-TBIs visits among females aged <5 years.

**22) Despite ESPN Article Claims, Insurance will not End Youth Football, John Sadler, Sadler Insurance, March 2019**

The carriers writing General Liability in the concussion-prone sports demand concussion risk management programs similar to what is required under state law and by governing bodies. These programs should key in on training for staff, parents, and players on the basics of concussions; how to recognize a concussion, mandatory removal from play, mandatory treatment, and gradual return-to-play protocols. They would also like to see specific training on how to remove the head from the tackle and practice contact restrictions. We provide a free brain injury risk management program that covers all of these elements for our football clients.

And these risk management programs have been successful in preventing second-impact syndrome lawsuits to a great degree. Now that second-impact syndrome has been contained, the activists are now turning their attention to CTE. And, I don't think that the CTE issue is going to be concluded either way anytime soon. But the intelligent response to CTE is practice contact restrictions such as the ones advocated by your organization. The Datalys Study which was commissioned by USA Football, in my opinion, clearly showed that practice restrictions played an even larger role in reducing concussions than removing the head from the tackle.

**23) Study Tackles Parents' Views on Youth Football Tackling Age Limits, by Elizabeth Hlavinka, Staff Writer, MedPage Today April 01, 2019**

LaBella noted that the evidence for long-term outcomes of tackling and head impacts on the developing brain is "unclear," citing one popular study with several limitations that found exposure to tackle football before age 12 was associated with future cognitive impairment and depression and another longitudinal study that found no differences in either outcome when comparing high school football players to a control group.

While the former "received widespread media coverage, which has led to significant public concern about the safety of youth tackle football," however, the latter "did not make any headlines," LaBella wrote. "So the public does not get a balanced report of the research."

LaBella said that the most notable finding of this study was that more than three-quarters of parents perceived concussion incidence to be more than 10% among high school tackle football players, and one-quarter estimated it was more than 50%. LaBella noted that in reality, only about 4%-7% high school players will suffer a concussion per season, and the risk for youth players is even lower.

"This misperception about concussion risk in youth tackle football is likely due to the fact that most parents form their views on the basis of headlines and stories of former players in the media, rather than from published scientific data," LaBella said.

**24) Back in the Game: Why Concussion Doesn't Have to End Your Athletic Career, Jeffrey Kutcher, Joanne C., Gerstner, Oxford University Press, 2017**

- Page 4: "But what we witness, either live or on video, does not necessarily line up with what is actually happening medically. The idea that every big hit or violent fall will create a concussion is inaccurate.



## H.2007 Opposition Letter

- Even the “obvious” cases are sometimes misleading. The reality is, diagnosing a concussion is not as simple as watching a video clip or a report on ESPN.”
- Page 9: “Wearing the newest equipment, buying the most expensive helmet, going for the latest gadget touted to monitor the brain, playing cautiously, working on excellent conditioning and technique, receiving the best training from great coaches, and having skilled medical staff on the sidelines may all help improve overall safety, but these things cannot prevent concussions from occurring. There is no physical sport that can be truthfully touted as ‘concussion free.’”
  - Page 12: “What concussions are—and more importantly, what they are not—is becoming more confused and muddled in the at-large conversation about sports, concussions, and athletes. The murkiness in facts and messaging leaves parents, coaches, and athletes in an uncomfortable limbo. They are being influenced by information that is not medically sound and are now often choosing to preemptively limit an athlete’s participation in sports out of a fear of concussions that is based on questionable assumptions. Parental peer pressure is spreading. ‘Youth football is too dangerous’ and ‘Three concussions and you’re done’ are common memes. More and more frequently I even hear warnings like ‘Don’t let your child play soccer, because they will get a concussion and become neurologically compromised for life.’”
  - Page 13: “Yet a growing number of parents are having their children avoid participating in contact sports such as football or ice hockey to ‘protect’ them from concussion. If the right measures are in place, that drastic step is unnecessary. In fact, I’d argue, being overprotective for no reason can be detrimental in other ways. Being involved in sports is a normal, positive activity for youth and adults, promoting good health, emotional and mental release, and personal growth through human interaction.”
  - Page 25: “Despite the compelling narrative, the reality is that concussions and long-term effects like CTE are completely different processes that may not even be closely related.”
  - Page 26: “Medically, we are not even close to understanding all the connections that might exist among sports, concussions, depression, suicide, and CTE.”
  - Page 40: “Dr. Giza says ‘Being overprotective or overreactive, without the proper evidence or cause, about concussion isn’t the way we should be going. We need to be safe, smart, and prepared to help children be involved in sports and have fun. That’s always my goal, as both a physician and parent.’”
  - Page 42: “Being afraid of the unknown and, at this point, unproven doesn’t outweigh the good of participating in athletics in any form and at any level. The values learned, the joy in acquiring new skills, the fun of play, and the relationships and self-confidence built from youth sports should far outweigh fears of concussion”
  - Page 50: “The formulaic nature of sports medicine is one of the areas of concussion care that we must improve. The quality of diagnostic approach and management that athletes – especially our youngest athletes – receive varies widely. We can, and should, do better.”

**25) Sub concussive head impacts in sport: A systematic review of the evidence, Mainwaring L, Ferdinand Pennock KM, Mylabathula S, Alavie BZ, PubMed, Feb 2018**

*PURPOSE: To identify and evaluate the evidence that examines sub concussive impacts in sport-specific settings and address two objectives: a) to determine how 'sub concussion' is characterized in the current literature, and b) to identify directions for future research.*

*RESULTS: A total of 1966 articles were screened. Fifty-six studies met the inclusion criteria. Studies were classified into three main categories based on primary focus: neurobiological, neuropsychological, and impact exposure metrics. The neurobiological studies suggested that in male athletes, functional and microstructural deterioration was associated with repetitive head impacts. There was insufficient to weak evidence for the relationship between repetitive hits to the head and deterioration in neurocognitive performance. Studies of impact exposure metrics examined various indices, including linear acceleration, rotational acceleration, and*





## H.2007 Opposition Letter

location and frequency of hits. Insufficient evidence was presented to determine a minimal injury threshold for repetitive hits to the head. Across all categories of studies there was a lack of consistency and clarity in defining and measuring variables related to the concept of 'sub concussion'.

**CONCLUSIONS:** Evidence reviewed predominantly from studies of male athletes in contact and collision sports identifies that repetitive hits to the head are associated with microstructural and functional changes in the brain. Whether these changes represent injury is unclear. We determined the term 'sub concussion' to be inconsistently used, poorly defined, and misleading. Future research is needed to characterize the phenomenon in question.

**26) Chronic Traumatic Encephalopathy-Like Abnormalities in a Routine Neuropathology Service, Noy S, Krawitz S, Del Bigio MR, PubMed, Dec 2016**

Chronic traumatic encephalopathy (CTE) has been described mainly in professional athletes and military personnel and is characterized by deposition of hyperphosphorylated tau at the depths of cortical sulci and around blood vessels. To assess CTE-like changes in a routine neuropathology service, we prospectively examined 111 brains (age 18-60 years). The presence of tau-immunoreactive deposits was staged using guidelines described by others and was correlated with the medical history. 72/111 cases were negative for CTE-like changes; 34/111 were CTE stage <1; 3/111 were CTE stage 1; and 2/111 were CTE stage 2. The combined history of head injury and alcohol and/or drug abuse was a significant predictor of any CTE-like changes. Age was also a significant predictor; most with any CTE-like changes were >40 years old. CTE-like changes were not identified at sites of contusion. Among a separate group studied retrospectively, we identified 4 cases that met full criteria for CTE. We conclude that CTE-like findings are not confined to professional athletes; the risk factors of head injury and substance abuse are similar in the routine population. However, the significance of very small hyperphosphorylated tau deposits remains to be determined. In addition, the absence of typical CTE-like deposits near contusion sites keeps open the question of pathogenesis.

**27) Treatment of Acute Sports Related Concussion, Current Reviews in Musculoskeletal Medicine, Anjali Gupta, Greg Summerville, Carlin Senter, Springer.com, March 18, 2019**

**Purpose of Review:** Here, we summarize the current scientific literature on the management of sports-related concussion (SRC) in the acute period (< 6 weeks post-injury) with a focus on rest, return to learn, return to play, and emerging treatments.

**Recent Findings:** While relative rest is recommended for the first 24–48 h following acute SRC, the most recent guidelines highlight the lack of evidence for complete rest and in fact show that prolonged cognitive and physical rest can be detrimental. Gradual return to learn and play is recommended. Return to sport should only occur once the patient is symptom free. While there are no FDA-approved medications for acute treatment of concussion, there is preclinical data for the benefit of omega 3 fatty acids. Evidence is limited around the benefits of treating sleep disorders, vestibular-ocular dysfunction, and neck pain in the acute period.

**Summary** After 24–48 h of rest, SRC patients may gradually resume cognitive and physical activity. More research is needed to determine if any supplements, medications, and/or physical therapy are indicated in the management in acute SRC.



## H.2007 Opposition Letter

28) **Are We Scoring a Goal by Banning Headers From Soccer?, Clinical Journal of Sports Medicine, Manalac, Fernando J., MD, MMM, FACP, CAQSM; Loffreda-Mancinelli, Claudio, MD, MMM, January 2019**

Soccer is a high-to-moderate intensity contact/collision sport. Concussions can result from direct or indirect force transmitted to the head. There is a generalized consensus in the scientific community on the application of specific guidelines for education, detection, diagnosis, and treatment of concussions.<sup>1-4</sup> Prevention remains a highly controversial topic. **There is little or no anecdotal evidence or statistical data indicating that purposeful heading is likely to lead to acute or cumulative brain damage. Most studies are either inconclusive or suggest that the speed and force associated with the purposeful heading of a ball are generally much lower than those required to cause a concussion.**<sup>5-9</sup> Despite the paucity in the concussion prevention literature and in response to a class action lawsuit, the United States Soccer Federation (USSF) adopted a policy<sup>6</sup> that banned players under the age of 11 years from heading the ball, and for players between 11 and 13 years, the policy limited the number of headers they could perform during a practice. Because of its controversy, the topic sparked much debate with the American public. One of the most recent studies regarding concussion, which influenced the USSF's decision, involved a large retrospective analysis of longitudinal surveillance data from high schools. These data were collected between 2005 through 2014 and were analyzed by researchers at the University of Colorado and subsequently published in *JAMA Pediatrics*.<sup>10</sup> The study reports that the rates of concussion in girls and boys are the second highest and fifth highest, respectively, among 9 examined sports. In 30.6% and 25.3% of the concussions among male and female players, the heading of the ball is recognized as the specific cause of the concussion. **Athlete-to athlete contact is the main cause of concussion in soccer, with an incidence of 68.8% for boys and 51.3% for girls.** Concussions may also occur when the ball hits an unprepared player in the head,<sup>11</sup> when a player's head hits the ground after a fall, or when a player hits a stationary object, such as a goalpost. The University of Colorado study focused on high school soccer players, a heterogeneous group. Players differ greatly in their skills, time, and level spent playing the sport. **Most importantly, on each team, there are players of different ages, from 14-year-old freshmen to 19-year-old seniors. The time between 14 and 19 years of age is a vital period of adolescence during which boys and girls experience their most significant physical development, emotional growth, and intellectual maturation. A 14-year-old player may have an elevated chance of injury in a collision with a 19-year-old player.** In addition, a 14-year-old player may become injured when heading, deliberately or otherwise, a ball that has been kicked forcefully by a 19-year-old player. The Soccer Youth Federation is aware of these age-specific differences. All organizations, from inhouse youth programs to travel clubs, private cup elite teams, and Olympic Development programs, divide their players by age groups. In contrast, high school programs promote the integration of age groups. Certain questions are pertinent: **Why are we arbitrarily targeting 13-year-old and under players, given that such players were not in the pool of players examined in the University of Colorado study? Since the University of Colorado study was based on data collected from high schools, should we not target that specific level of competition? When those 14-year-old underclassmen may start playing against juniors and seniors at varsity level, will they be exposed to potentially greater risks of all types of injuries, including concussion from heading the ball, a technique to which they have not been exposed? Preventing injury, particularly concussion, in soccer at any age group has been elusive to say the least. Consequently, there is a large gap in the current literature regarding various approaches to concussion prevention.** One meta-analysis published in the *British Journal of Sports Medicine*<sup>12</sup> in June 2016 found 14 studies regarding concussion prevention through novel equipment (such as headgear and mouthguards); however, only 1 study could be found that looked at implementing concussion education and concussion training programs. **A Swiss study<sup>13</sup> published in 2002 in the American Journal of Sports Medicine found that implementing an injury prevention program at the youth soccer level significantly reduced injury overall, including head trauma and concussion. In all sports, the adolescent's musculoskeletal development, specific skills, the proper teaching of techniques, and vision for the game are developed and improved after countless training/ teaching hours. Mastering these aspects of the game may also help to minimize the occurrence of undesirable incidents.** The National Soccer Coaches Association of America (NSCAA) states, "Faulty techniques taught at a young age



## H.2007 Opposition Letter

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can lead to bad habits and perhaps even injury. It is recommended that the coach has significant knowledge of the techniques and how to practice them before undertaking teaching them to young players". 14 The use of the proper equipment is equally important to injury prevention. The specific ball size, type, and inflation, appropriate for the level of players "age, should always be used." Fortunately, technology has been effective by triggering a move away from water-retaining leather balls.

### 29) 7 Surprising Facts about CTE, All Concussion.com, March 12, 2019

*It's been one shock after another.*

*After raising a few questions about CTE last summer and incurring quite a bit of wrath upon doing so, I started looking into it in more detail. What I've found has both surprised and alarmed me. In this post, I share issues I've come across as well as suggestions for fixing each situation. Hopefully changes can be made to address these issues. Read on!*

#### 1) *There doesn't seem to be much to Stage I.*

*Just like everyone else, I've seen all the news articles and stories about people that had CTE. Because of all I had read and seen, my impression was that it was awful, for any stage. I also assumed that it would be widespread throughout one's brain at any stage. As it happens, that's not the case. I was surprised to find that there really isn't much to Stage I. These are the characteristics:*

*It's found in only one or two locations in the brain. If CTE is found in three locations, it bumps up to Stage II. [1]*

*It's classified as "Very Mild" in the McKee staging criteria, which is used by pathologists to diagnose CTE. [1]*

*In images I've seen of Stage I, there are often visual aids to help readers locate it. Otherwise, it would be more difficult to find in the images. [1] [2]*

*In some graphics I've seen in news articles, Stage I is not included. Stage II is instead included as an example of "Mild" CTE.*

*The images of Stage I left me with a question for scientists: how does such a small amount of tau cause all the problems to which CTE Stage I is attributed in news articles? I'm not questioning the existence of CTE or Stage I; I'm questioning how it works, exactly, to cause issues in what appear to be very minimal amounts. Look at the images yourself. What do you think? Keep reading; there's more.*

*Articles don't always mention what stage was diagnosed. However, marketing efforts by brain banks and others always mention stages.*

### 30) Things To Know About CTE, Brainwashed Book, Merril Hoge, Dr. Peter Cummings, 2018

- *To date, rigorous scientific research tells us only that CTE leaves deposits of perivascular tau in the folds of the brain. It does not reveal conclusively what causes tau deposits to form or what clinical symptoms, if any, they cause.*
- *CTE's true prevalence is unknown.*



## H.2007 Opposition Letter

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- *The role of genetics, mental illness, and other disease processes in the symptoms currently labeled as CTE is unknown.*
- *The causal connection between brain trauma and brain pathology is unknown.*
- *The association between brain pathology and mood, cognitive, or behavioral symptoms is unknown.*
- *There is no evidence CTE causes any mood, behavior, or cognitive disorders; many neuropsychiatric conditions associated with CTE are also associated with other, more common neurodegenerative diseases.*
- *The role of preexisting mental health issues in clinical symptoms currently assumed to be caused by CTE is unexplored.*
- *Clinical and pathological staging of CTE has not been validated by the scientific community; “stage I CTE” is very likely a normal brain, not a diseased brain.*
- *There is substantial evidence to suggest that CTE is caused by chronic inflammation.*
- *All the brains in the infamous “110 out of 111” brains case were from players whose families reported that they had mental problems; there was no control group.*
- *There is no agreed-upon definition of a sub concussive impact (SCI), so it is not a scientific concept.*
- *There is no evidence that early childhood exposure to tackle football leads to neuropsychiatric problems later in life.*
- *There is no evidence that CTE causes suicide.*

**31) Football Players’ Head-Impact Exposure After Limiting of Full-Contact Practices Steven P. Broglio, PhD, ATC; Richelle M. Williams, MS, ATC; Kathryn L. O’Connor; Jason Goldstick, PhD; Journal of Athletic Training, Volume 51, Number 7, July 2016**

*Main Outcome Measure(s): Head-impact exposure was monitored using the Head Impact Telemetry System while the athletes participated in football games and practices in the seasons before and after the rule change. Head-impact frequency, location, and magnitude (ie, linear acceleration, rotational acceleration, and Head Impact Telemetry severity profile [HITsp], respectively) were measured.*

*Results: A total of 15 398 impacts (592 impacts per player per season) were captured before the rule change and 8269 impacts (345 impacts per player per season) after the change. An average 42% decline in impact exposure occurred across all players, with practice-exposure declines occurring among linemen (46% decline); receivers, cornerbacks, and safeties (41% decline); and tight ends, running backs (including fullbacks), and linebackers (39% decline). Impact magnitudes remained largely unchanged between the years.*

*Conclusions: A rule change limiting full-contact high school football practices appears to have been effective in reducing head-impact exposure across all players, with the largest reduction occurring among linemen. This finding is likely associated with the rule modification, particularly because the coaching staff and offensive scheme remained consistent, yet how this reduction influences concussion risk and long-term cognitive health remains unknown.*

**32) Largest study of CTE finds it in 6% of subjects: Interestingly, the traumatic brain disease is identified in both athletes and non-athletes, June 2019**

*Nearly 6% of athletes and non-athletes were found to have the neurodegenerative disorder chronic traumatic encephalopathy (CTE) in the largest, and broadest, study conducted of the disease to date. The findings were published June 14 in the international journal Brain Pathology.*



## H.2007 Opposition Letter

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"Generally our findings point to CTE being more common in athletes and more common in football players, but this study is a bit more balanced and accurately reflects the general population compared to previous studies," said lead author Kevin Bieniek, Ph.D., of UT Health San Antonio. Dr. Bieniek led the research while at the Mayo Clinic before moving to Texas. He now directs the brain bank at the Glenn Biggs Institute for Alzheimer's and Neurodegenerative Diseases, which is part of UT Health San Antonio.

### **Unbiased screen**

CTE, linked with repetitive blows to the head, has been found in 80-99% of autopsied brains of pro football players. "Nobody has really looked at it from kind of an epidemiological perspective," Dr. Bieniek said. "We compared people who played a sport with those who didn't play. We studied both young and old people, and amateur players versus college and professional players. And we studied both men and women, which had not been done previously. What we aimed to do was an unbiased screen for CTE from all sorts of different cases."

### **Biographical information utilized**

The team scanned obituaries and high school yearbooks of 2,566 individuals whose brain autopsies are a part of the Mayo Clinic Tissue Registry. The study focused on a variety of contact sports: baseball, basketball, boxing, football, hockey, lacrosse, soccer and wrestling. Non-contact sports, such as golf and tennis, were excluded.

This analysis identified 300 former athletes and 450 non-athletes. "We screened the brains of all of these cases for evidence of CTE in a blinded fashion, intentionally not knowing which brain tissue was related to which case," Dr. Bieniek said.

### **Findings**

A small number of cases, 42, had CTE pathology (5.6% of the total). CTE was found in 27 athletes and 15 non-athletes, and in 41 men and one woman. American football had the highest frequency of CTE (15%) of the contact sports studied, with participation beyond high school resulting in the highest risk of developing CTE.

"The 42 cases, or 6%, is more of a grounded, realistic number," Dr. Bieniek said. "That might not seem like a lot, but when you consider there are millions of youth, high school and collegiate athletes in the United States alone who play organized sports, it has the potential of being a significant public health issue. There are many ongoing questions regarding CTE pathology, however, and we don't want to discourage sources of healthy physical and cardiovascular activity like these sports. Rather, we emphasize safe strategies to reduce the possibility of head injuries and properly treat them when they are sustained."

### **Non-athletes' cases**

The identification of 15 CTE cases in non-athletes raises interesting questions, Dr. Bieniek said. "Did these people have trauma from another source?" he asked. "Were they actually athletes and we were unable to detect it from biographical information? Is there another disease with similar features?"

Cases with CTE tended to be a bit older than the cases without it, and many CTE cases also showed evidence of Alzheimer's disease. "At the Glenn Biggs Institute, we study the concept of multiple neurodegenerative disorders happening within the brain of a person who has dementia," Dr. Bieniek said.



## H.2007 Opposition Letter

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### ***The crucial role of donors***

*"This is an important national study led by our brain bank director, Dr. Bieniek," said Sudha Seshadri, M.D., professor of neurology at UT Health San Antonio and director of the Glenn Biggs Institute. "We have a great team of scientists at the Biggs Institute, and the brain bank is key to the research aims of these investigators. We are so grateful for the many patients and normal older persons who have signed on to be brain donors after their death. The program runs 24/7/365, is free to the family, and gives the family the peace and knowledge of a definitive diagnosis for their loved one's condition."*

*Several studies related to traumatic brain injuries and CTE by Dr. Bieniek and his colleagues are currently ongoing at UT Health San Antonio, including how certain genetic variants might protect or put a person at higher risk for developing CTE.*

We are calling all stakeholders - including players, parents, coaches, league representatives, medical experts, and legislators - together, to provide the safest possible environment for our youth in Massachusetts and America.

Respectfully,

Dr. Peter Cummings  
Chair, Medical Advisory Committee – California Youth Football Alliance

Steve Famiano  
EVP, Community Development – California Youth Football Alliance

Joe Rafter  
Co-Founder & President – California Youth Football Alliance

Ron White  
EVP, Standards & Practices – California Youth Football Alliance