EXHIBIT 2

EXPERT REPORT OF STEPHEN T. CASPER, PH.D.

ROBERT AND DEBRA GEATHERS VS. NCAA

(ORANGEBURG COUNTY, SOUTH CAROLINA COURT OF COMMON PLEAS)

PREAMBLE

1. Robert Geathers was born in Georgetown, South Carolina and played football at Choppee High School (one or two years) and South Carolina State University (1977 to 1981). He was a third round draft pick of the Buffalo Bills of the National Football League, but never player professional football because of a back injury. He played on the defensive line at South Carolina State University.

2. In 2011 or 2012, Mr. Geathers began to show symptoms that progressed over many years and were diagnosed as neurocognitive injury and dementia in 2017 and 2019, caused by repeat head impacts in football, the vast majority of which took place at South Carolina State University. By 2021, his symptoms are profound and severe.

3. The report that follows shows that despite being founded in 1906 for the purpose of protecting and ensuring the health and safety of college students who played sports, most especially college football, the NCAA never instituted any reasonable precautions to protect Robert Geathers from the latent brain disease he developed or warned him of the risks of latent brain disease when he played, which was well known by scientists and doctors, and which the NCAA knew well since its first concussion crisis. The NCAA never warned Robert Getahers after he had played NCAA football and to this day, the NCAA denies responsibility for what has happened to him. This report, based on the published record of science and medicine over many years, and based on the NCAA's own documents, provides the history of what the NCAA did, what it knew, when it knew it, and what it never told Robert Geathers and other NCAA football players during the relevant time period. I reserve the right to supplement my opinons and findings as additional information comes to my attention in this and other cases.

TABLE OF CONTENTS

I. QUALIFICATIONS

4. I am Professor in the History of Science at Clarkson University in the Department of Humanities and Social Sciences. I am an historian of medicine and science. My special expertise is the history of the mind and brain sciences and medicine (neurology, physiology, neuroscience, psychology and psychiatry). I am also regarded as an authority on the specialization of medicine in history and the historiography of the patient in medicine. My CV is attached as Exhibit 1. I earned my PhD from University College London in 2006 and was awarded a fellowship for the entirety of my doctoral training. My published work and experience is set forth in my CV.

5. I am charging the plaintiffs $350 per hour for my services, except for my research, which is being billed at a rate of $250 per hour, and non-working travel time, which is being billed at $175 per hour. Within the preceding four years, I have been deposed as a plaintiffs' expert in two cases (see Exhibit 2).

II. SCOPE OF OPINIONS

6. This report analyzes the scientific and medical knowledge of the National Collegiate Athletic Association (NCAA) concerning trauma-based brain injury, damage, and disease, particularly with respect to repetitive hits to the head in sports and specifically football as conducted and controlled by the NCAA. It addresses what the NCAA knew, what it did, and what it failed to do by examining: i) The origins of 20th century knowledge of trauma-based brain injury (in sports as well as other circumstances) and associated long-term neurological consequences and risks, (ii) The development of this brain injury knowledge overtime, (iii) the ways clinicians, scientists, and engineers have addressed sports-related brain injury over time, and (iv) the actions and inactions of the NCAA regarding these issues based on the actual knowledge of the NCAA concerning these issues.

III. SUMMARY OF OPINIONS

7. The NCAA has known for a century that immediate and latent brain damage can arise from repeat concussive and subconcussive hits on the field in practices and games. Brain damage may vary in severity. A mild concussion that looks relatively benign on the football sidelines can develop into latent brain disease years later if the player/patient is not monitored and treated effectively. Because the NCAA was the organization created to protect the health and safety of (specifically) college football players, the NCAA was aware of this problem since its inception. The NCAA knew that concussions were a significant problem in college football since 1906, when college presidents nearly banned the game. The NCAA's knowledge of these injuries developed over time with the development and popularity of the sport and the

steady advance of sports medicine and the kinetics of how the brain moved within the skull. Often the injuries (both immediate and latent) are described by various names. Those include concussions, contusions, lacerations, bruising, brain damage, brain injury, traumatic brain injury, punch drunk syndrome, neurodegenerative disease, moderate traumatic brain, mild traumatic brain injury, traumatic encephalopathy, and chronic traumatic encephalopathy or CTE.

8. The historical record shows that for a century scientists and clinicians have refined their explanations for the pathological (or cellular level) consequences of concussive and subconcussive blows to the head and the resulting sequelae of those injuries, both in their immediate and long-term effects. These scientific and clinical sources record the clear cause and effect between blows to the head in sports and the long-term neurological effects, which often develop into latent trauma-based brain disease, sometimes called CTE.

9. The historical record also shows no meaningful distinction between blows to the head suffered in one context versus another. The risk of sequelae from brain injury and damage is not dependent upon whether a blow to the head was suffered during a sporting event, car accident, physical assault, domestic battery, military exercise, combat, or any other context.

10. There can be no reasonable dispute that the NCAA accepted primary responsibility for the health and safety of students participating in athletics in 1906, and specifically football. Having accepted that primary responsibility, the NCAA had an obligation to use its superior knowledge and power to warn students and take reasonable steps to protect their health and safety regarding head injuries in football and other athletic events. This obligation was particularly true regarding college football and the risks of long-term latent brain disease. The NCAA had an obligation to keep itself informed but also to keep informed both the students and member institutions concerning the medical risks associated with college football. Because the NCAA was aware of the dangers of brain injuries in football in 1906, and on an ongoing basis as medical science developed, the NCAA had an obligation to be vigilant, knowledgeable, and well-informed about those injuries from 1906 onwards. It also had an equal obligation to keep its member institutions and students well-informed about these risks and to implement methods and practices to mitigate those risks.

11. Based on these obligations, and the documents in the NCAA's possession, the NCAA knew early in its existence that concussions have a wide range of severity and outcomes that have led clinicians to be deeply concerned by blows to the head sustained by college students in football as early as 1906. Because the NCAA was founded to address these kinds of health concerns and to be faithful to its founding mission, the NCAA should have warned about the dangers of repeat concussions since 1906 and developed protocols to identify and mitigate concussive injury of any kind in college football.

12. The NCAA's knowledge and understanding of these dangers was extensive and growing. It developed over time as sports medicine and neuroscience developed. By 1933, the NCAA had a more fully developed understanding about how dangerous and common concussions had become in college football and how mild concussions can have very poor outcomes ten, fifteen, and twenty years later. The NCAA knew that multiple petechial hemorrhages had been found to result from concussion by 1924 and had been suspected earlier. The NCAA and its medical advisors knew that the condition called "punchdrunk" syndrome had been examined pathologically in 1928 and was found to be a consequence of repeated blows to the head. The NCAA, for the first time, published a Medical Handbook that included a chapter on concussive injury in football, all of which was written by three of the most prominent physicians in the United States. That chapter recommended a strict protocol from the sidelines that would identify, assess, and treat concussive injury in football as it happened. That protocol included hospitalization after a concussion. The NCAA never implemented that protocol on any level of the game.

13. Therefore, from 1933 onward, the NCAA was aware that repeated head trauma in college football, no matter how mild, could and sometimes did result in "punchdrunk" syndrome or "dementia pugilistica" or, as it was sometimes called by the 1940s, chronic traumatic encephalopathy. The NCAA was also aware that preventative measures were required. It is, therefore, puzzling that despite this clear knowledge and obligation, the NCAA did not require as mandatory any concussive protocol at all for college football until 2010. The NCAA never issued any publication to students and their families regarding concussion risks in football and appears to have ignored the significant brain injury health risks posed to the students who participated in college football.

14. The NCAA also had the authority and responsibility to warn students and to force member institutions to develop and implement a medical protocol that would mitigate and prevent as much as possible the risks identified. The NCAA had an obligation to charge athletic departments, coaches and medical professionals who supported NCAA activities with warning students about the risks of repeated brain injuries in every year after 1933.

15. By the 1950's, medical and physical science show that the medical and scientific communities well understood that blunt force trauma to the head of varying degrees of severity can result in structural damage to the brain, degenerating neurological diseases, and psychiatric sequelae, all of which can develop slowly over time. These conditions include traumatic dementia, chronic traumatic encephalopathy, Parkinsonian syndrome, amyotrophic lateral sclerosis, psychoses and other personality changes.

16. In 1958, the NCAA created a health and safety committee, later re-named the Committee on Competitive Safeguards and Medical Aspects of Sports (CSMAS), to bring additional institutional guidance to the NCAA's primary obligation: to protect the health and safety of students who participate in

college athletics, and particularly college football players. The NCAA knew that other neurodegenerative diseases could be caused by single or recurrent and mild blunt force trauma to the head, including amyotropic lateral sclerosis, Parkinson's syndrome, Alzheimer's disease, traumatic dementia (or CTE), and paralysis. This knowledge was within the medical literature in the 1950s, much of which was published by the medical departments of NCAA member institutions. By 1957, the NCAA knew that CTE included a profusion of senile plaques in brains subjected to repeat blows to the head. The NCAA had an obligation to update, inform and warn students and member institutions of what that finding meant in the context of college football. In fact, by 1958, the NCAA knew that concussive and subconcussive blows to the head were a known cause of CTE. By 1962, the NCAA knew that even very slight concussions could result in the death of brain cells.

17. By 1961-63, the NCAA was acutely aware that the game of college football had become much more dangerous. With the universal acceptance of the hard-shell plastic helmet and facemask, college coaches began to teach college players to use their helmets as weapons, and the players made this a common technique in games and practices to defeat and demoralize opposing players. The NCAA Football Rules Committee (FRC) and CSMAS were sufficiently aware of this problem that in 1963 the FRC imposed a rule change that made the use of the helmet as a weapon a personal foul and announced that rule change to every NCAA member institution, football coach and football official. The FRC and CSMAS seriously considered banning the plastic helmet, the facemask, or both because they were misused as weapons and created injuries. Despite this knowledge, the NCAA never enforced its 1963 rule against the misuse of the helmet as a weapon, never measured the frequency of concussive injury in football, and never imposed a sideline medical protocol with trained physicians to identify, mitigate, and treat concussive injury, no matter how mild.

18. In fact, the NCAA's own documents show that the NCAA did the reverse. The NCAA actively lied. Instead of telling players the truth, the NCAA in 1972 told coaches, players, and administrators that the hard-shell plastic helmet protected players against concussive injury, which the NCAA knew to be false then, just as the NCAA knows it is false today.[1] The truth, which the NCAA knew, was that the hard-shell plastic helmet was used as a weapon in blocking and tackling and had made the

[1] Compare, for instance, NCAA, "News Release: Football Helmet Safety Study Report," 10 May 1972 which says on pp. 1-2 "There is a wide difference in the performance of helmets, even among the same types, which indicates a need for standards that would eliminate unsafe helmets from the market" with what it said five days later in its definitive record, the NCAA News. See: NCAA, "NOCSAE Football Helmet Study Should Stimulate Safer Product," Vol 9, No. 7, 15 May 1972, see p. 6: "Current design of helmets has reached the point where the majority of them provide concussion protection up to levels which are rarely exceeded." See the quote from December 2013: "It should be noted that there is no helmet that can prevent a concussion." *NCAA Committee on Competitive Safeguards and Medical Aspects of Sports Position Statement* December 2013. See: https://www.ncaa.org/sites/default/files/Position+Statement.pdf accessed on 15 May 2021.

game far more violent. It aggravated and made more frequent concussive hits to the head. It did not mitigate them. Yet the NCAA spread a false statement to coaches and athletic administrators via the *NCAA News* which in 1972 was definitive voice of the NCAA on all matter involving athletics and sports safety. The intent of such a false statement was likely to make the concept an NCAA doctrine that would be imparted to college football players by those who supervised them: coaches, trainers, and athletic administrators. Now, in the modern age, the NCAA has been forced to retract the lie internally and has admitted that no helmet can prevent concussions in football.

19. How and why the NCAA turned its back on its founding mission and obligation to students who played college football is best explained by the rise of college football into an entertaining spectator sport on an industrial scale. As the NCAA and its successful membership reaped ever increasing revenues from ticket sales, TV, and radio contracts, the safety of students from concussion risks became unimportant. By the 1960's and 1970's, the revenue and notoriety generated by college football provided immense benefits to college and universities throughout the United States. Those revenues were counted as untaxed dollars, and they were not limited to gate receipts and revenue from media contracts. They also included increased enrollment, increased alumni donations, national notoriety, better faculty, more qualified students, and prestige. The NCAA, in turn, benefitted from this growth and was loath to upend the growth of its memberships' economic success by imposing health and safety rules that required sideline neurologists to make independent and irreversible determinations about whether a college player could return to play in any game or practice.

20. By 1966, the NCAA knew that "punchdrunk" syndrome was a form of chronic neuropsychological disorder "presumably due to repeated head trauma" and was but one of many permanent problems that could arise from blows to the head. By 1975, the NCAA knew that mild repeat concussions were cumulative injuries that caused intellectual impairments that would be detrimental to a student's academic success. The NCAA was well-aware that nationally known medical authorities on whom the NCAA had relied recommended that an athlete who experienced three concussions should never play contact sports again.

21. Strangely, the NCAA's Medical Handbook of 1933 does not appear to have been updated or implemented. This is a strange set of circumstances, in part, because the record of documents like these is missing until the NCAA published its continuation of the Medical Handbook in 1981, 1983, 1987, 1992, and 1993, and even then, failed to impose any mandatory concussion guidelines for a high-speed collision sport that had become increasingly violent. This happened even though for decades before, the CSMAS internally had expressed concern about concussions and brain injuries. This is also strange, because the NCAA published and copyrighted Sports Injury Handbooks from 1933 to 1961, which logic dictates would have included the NCAA's knowledge of the dangers of concussive injury in football and other sports, such

as boxing and ice hockey. Yet the NCAA cannot locate any of the Sports Injury Handbooks. All of them have disappeared from the NCAA's Main Library, Archives, and Distribution Center. None appear to have been converted to digital format. Along with the entire NCAA's Sport Sciences Collection, approximately two full shelves of documents relating to sports injuries over many decades, the Sports Injuries Handbooks have disappeared from the NCAA's depositories. Given that the NCAA is charged with knowledge of sports injuries to protect the health and safety of students who play competitive NCAA sports, this appears to be more than mere negligence. It appears to be an effort by the NCAA to hide what it knew about concussion injury in the years prior to the 1960s and as its football became far more violent.

22. The NCAA knew about the literature used to formulate the Colorado Medical Society guidelines for concussion management in 1991. The NCAA could also have endorsed the practice parameter published by the American Academy of Neurology in 1997 and used it to develop their own concussion guideline. The NCAA refused to do so.

23. The NCAA knew before Bennett Omalu published his 2005 report concerning NFL player Mike Webster that CTE in professional football players should not be a surprise, in part, because of the extensive history of this phenomenon since 1928 and also because neurosurgeon Robert Cantu, who frequently advised the NCAA, regarded Omalu's paper as something that should surprise no one.

24. The NCAA should not have waited for world-wide conferences to define a medical "consensus" on the risks of neurodegenerative disease (or CTE) caused by head injury in football. To fulfill its founding mission and duty to college football players, the NCAA had more than enough information in its possession since at least 1933 to inform coaches and students alike of the significant dangers of concussions in college football and to implement a medical protocol to identify, mitigate and treat concussive injuries as they occurred on college football fields. There was no need for a medical consensus, because the medical community and NCAA knew the risks since 1932 and knew the risks more acutely as medical knowledge advanced over the decades and as college football practices and games became a laboratory for head injuries to 17 to 23 year old students who participated in competitive football.

25. The delay and inaction by the NCAA can only be explained by an unwillingness to act for the students' benefit, which is most likely attributable to the immense college football establishment that had zero interest in disrupting or reforming a game that generated net revenue, notoriety, and prestige. The NCAA has never explained why the alleged existence of a disagreement among the medical community about the consequences of recurrent brain injury in football made it impossible for the NCAA to warn college players, administrators, and coaches alike that many neurologists have associated repetitive concussive and sub-concussive injury in sports generally and football specifically with latent neurodegenerative disease later in life. The NCAA has never explained why the concussion protocol designed and recommended by Thorndike, Fauver, and Raycroft in 1933 was never implemented at all.

26. The NCAA claims that since 1906 it holds as an essential mission its duty to protect the health and safety of students who participate in NCAA athletics.

27. The NCAA's own documents show that it has never been proactive on the issue of student health and safety. Consistently, it has sought medical safety information from known industry insiders and made minimal efforts over the last ninety years to listen to medical professionals, engineers, or scientists who have argued for precautionary approaches to the management of concussion. Rather, the NCAA has reacted slowly or not at all to health and safety issues and only when forced by federal or state legislation, successful litigation, or the threat of litigation. This has happened despite the fact that the NCAA has admitted that it regularly reached out to medical schools for the latest information on health and safety.

28. The NCAA operates as a cartel for the purposes of monetizing amateur sports for profit. The NCAA and its membership have reaped in billions of dollars over many decades by enforcing amateurism among the students who play college football and other sports. Yet at the same time, the NCAA has failed to do anything to identify, mitigate and treat its problems with concussion injury. The NCAA has failed even to provide a warning to students that the consequences of playing college football could result in a preventable and latent neurodegenerative disease that can and will alter their lives irrevocably.

29. The NCAA has argued numerous times in litigation that the bureaucratic structure the NCAA and its membership created prevents the NCAA and its membership from rapid and decisive action on issues related to student health and safety, particularly concussions in college football. Yet it was clear that college presidents, athletic directors, and students looked to the NCAA National Offices for education and regulation. The NCAA, therefore, should have acted decisively about that problem with a mandatory concussion protocol in 1933, but the NCAA failed to act until 2010 in the wake of congressional hearings on that very issue (but in fact there were no legitimate mandatory rules or protocols in place until 2015 as required by the terms of the *Arrington* Settlement). Further, the NCAA's litigation position is belied by the NCAA's response to the COVID19 pandemic. Commenced in February 2020, the NCAA mounted an aggressive plan that had an immediate impact on D1, D2, and D3 university athletic programs in all sports across the country. The NCAA's litigation position that the membership makes all decisions is either a partial truth or outright misleading.

IV. METHODS

30. This report reflects my knowledge and expertise as an historian of medicine and science with almost two decades of dedicated historical experience in research, teaching, and professional service.

The report relies on standard historical methods and techniques in intellectual and cultural history.[2] It draws on my research on the history of neurology and neuroscience and particularly to the history of brain injury in the modern world. As in all of my work and publications, I have upheld the highest of standards for historical research consistent with the guidelines of professional conduct published by the American Historical Association (AHA).[3]

31. I have had access to NCAA internal documents that are extensive. I was surprised to learn that important materials related to the NCAA's record of health and safety were removed from the NCAA archives and cannot be found. As a result, the NCAA has lost and been unable to produce many books and documents important to my assessment. Among the lost items are "Sports Injuries handbooks, 1933-1961." The NCAA itself published these immediately after its 1933 Medical Handbook (which had a chapter on concussion prevention and treatment in football) and received funds for them, for example, in 1939 and 1940.[4] Other important NCAA sources from those earlier periods, which include the NCAA Medical Handbook, are a discussion in the 1938 Proceedings of the NCAA Convention, and facts about concussions and chronic traumatic encephalopathy found in boxing rules. Based on this existing information, it is very probable that 28 years of NCAA Sports Injuries Handbooks contained information that is directly relevant about what the NCAA knew about potential harm to students from concussive injuries arising from football. As an historian of medicine, I have rarely seen a circumstance in which documents fundamental to an organization's past operations, mission, and core knowledge have disappeared in their entirety.

32. The missing records were clearly protected and valued when the NCAA moved its entire library in "four semi-trailers" from Kansas City to Indianapolis.[5] The maintenance of historical records was part of the NCAA's core competencies for its library. The fact that the NCAA Sports Injuries Handbooks from 1933 to 1961, which almost certainly contain highly relevant information concerning the subject matter of these lawsuits, has lost these volumes is a serious concern.

33. There are other methodological limitations placed on this report as well. The NCAA's mishandling of its own files is not limited to the Sports Sciences Collection and Sports Injuries Handbooks 1933-1961. Archival NCAA papers are also missing that the NCAA should possess and maintain according with its own policies. The secretary of the NCAA Football Rules Committee, David M. Nelson, left 46 linear feet of boxes of documents to the University of Delaware Library. Some of those papers are directly

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[2] See for a representative example Jordonova, Ludmilla. 2000. *History in Practice*. London. Oxford University Press.

[3] American Historical Association "Statement on Standards of Professional Conduct (updated 2018). https://www.historians.org/jobs-and-professional-development/statements-standards-and-guidelines-of-the-discipline/statement-on-standards-of-professional-conduct#Reputation Accessed 1-3-2019.

[4] NCAA "Report of the Treasurer" NCAA Proceedings 1940, pp. 166-167.

[5] Douglas, Lisa Greer, Rochelle Smith, and Beth Hansen. "There's A Library for That???." *Indiana Libraries* 27, no. 2 (2008), p. 72.

relevant to NCAA's knowledge, actions, and inactions. They establish that the NCAA by the early 1960s knew that the advent of the hard-shell plastic helmet and facemask had transformed the game and made it far more violent, particularly with respect to the risks of concussion injury. The NCAA, however, possesses none of these separate documents, many of which should be in the files of the Football Rules Committee, the CSMAS, and the archives of former NCAA Executive Director Walter Byers.[6] The fact that these documents are missing from the NCAA's historical files is concerning for the same reasons the Sports Sciences Collection (81 separate documents) and the Sports Injuries Handbooks 1933-1961 (28 years) are missing. It leads to the inference that NCAA personnel or lawyers identified documents that incriminated the NCAA in these and other lawsuits, and purposefully removed or destroyed those documents. This presents an odd problem for an historian in that I have had to search for the NCAA's records outside of the files in the NCAA's possession. Some of these papers come from the University of Delaware, as discovered by counsel. Others I have found elsewhere or purchased over the internet. The documents the NCAA should have, but does not, are identified in a subpart of the attached appendix of materials which I have considered to support the opinions stated in this report.

V. INTRODUCTION

34. The NCAA has stated many times that the health and safety of students in competitive sports was the central justification for the organization's origins and a major motivator for its continued presence in the landscape of North American sports.[7] Alongside the creation of uniform rules for all sports, dogged enforcement of what it deems amateurism, and the rational organization and planning of tournaments, the NCAA has purported to keep students safe in competitions that over the twentieth century became ever more gladiatorial.[8] As Mark A. Emmert, President of the NCAA, stated in 2014 before the

[6] See "David M. Nelson Papers" University of Delaware, https://library.udel.edu/special/findaids/view?docId=pdf/mss0328.pdf Accessed on 2-17-2021.

[7] As one stakeholder put it in the *NCAA Strategic Planning Initiative Stakeholder Analysis Summary Report* in 2018, the NCAA governs college athletics by overseeing and organizing: "intercollegiate athletics under an umbrella where student-athletes are cared for in terms of health, safety and general welfare" and as another stakeholder said "to oversee the health and well-being of intercollegiate athletics." NCAA_Finnerty_1396001; a history of this moment is provided in Smith, Ronald A. 1990. *Sports and freedom: The rise of big-time college athletics*. Oxford. New York. Oxford University Press offers a chapter on this history entitled "Brutality, Ethics, and the Creation of the NCAA." See pp. 191-208.

[8] The NCAA website in 2019 included this passage: "In 1906, the NCAA was founded to keep college athletes safe. We are working hard to protect them physically and mentally, on the field and off." See: "Well-Being," http://www.ncaa.org/health-and-safety Accessed June 5, 2019. Football was first described as a gladiatorial sport in the founding documents of the NCAA, see: Pierce, Palmer E, 1907. "The International Athletic Association of the United States: Its Origin, Growth, and Function" in Intercollegiate Athletic Association of the United States. *Proceedings of the Second Annual Convention of the Intercollegiate Athletic Association of the United States* New York City, 28 December 1907, p. 28. Also see: Smith, Ronald A. 2011. *Pay for Play: A History of Big Time College Athletic Reform*. Urbana. Chicago. Springfield. University of Illinois.

United States Senate Committee on Commerce, Science, and Transportation: "I will unequivocally state we have a clear, moral obligation to make sure that we do everything we can to support and protect student-athletes."[9]

35. Among sports controlled by the NCAA over the last century, none ranks higher than football. "Football spawned the NCAA…," writes Joseph N. Crowley in the centennial history of the organization.[10] It was well-recognized at its creation by apologists and critics of college sports that football, above all sports, resulted most commonly for students in injuries, disabilities, and even death.[11] Brain injuries were always central in expressions of concern.[12] For these reasons, the NCAA early on accepted as a special responsibility an obligation to keep students who play football safe.[13] Without that safeguard, it is unlikely that its member institutions could permit the existence of football on their campuses.[14] But for the existence of the NCAA, and the supposition by all stakeholders, that it acts for all to fulfill this primary, foundational obligation, college football would probably have to be a professional sport.[15]

36. The NCAA's history, however, makes clear that the organization lost sight of this primary responsibility. Walter Byers, the first executive director, recalled that he was "charged with the dual mission of keeping intercollegiate sports clean while generating millions of dollars each year as an income for the colleges…. We proved barely adequate in the first instance, but enormously successful in our second

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[9] Committee on Commerce, Science and Transportation United States Senate. 2014. "Promoting the Well-Being and Academic Success of College Athletes, Wednesday July 9, 2014. pp. 60-61. That "clear, moral obligation" was not in evidence in 2013 as Nathan Fenno reported in the *Washington Times* "The protection of college athletes isn't the NCAA's legal responsibility, the organization maintained in a court filing last week obtained by The Washington Times. "The NCAA denies that it has a legal duty to protect student-athletes," the document said, "but admits that it was 'founded to protect young people from the dangerous and exploitative athletic practices of the time.'" See: https://www.washingtontimes.com/news/2013/dec/18/court-filing-ncaa-denies-legal-duty-protect-athlet/ Accessed on 15 May 2021.

[10] Crowley, Joseph N. 2006. *In the Arena: The NCAA's First Century*. Indianapolis. NCAA., p. 35.

[11] Fort Wayne Daily News (Fort Wayne, Indiana). 1900. "Harness in Football, Players using it to an Excess this Season. Some of the new Devices." November 12: 8; St. Louis Republic (St. Louis, Missouri). –1903. "Changes Likely in Style of Rugby Football Play." January 4: 24; The Saint Paul Globe (Saint Paul, Minnesota). 1905. "President Eliot Flays Football: Head of Harvard Says the Game is a Positive Menace." February 3: 5.

[12] 1905. The Question of Football," *The Lancet*. pp. 1422-1423; Nichols, E.H., Smith, H.B. 1906. "The Physical Aspect of American Football," *Boston Medical and Surgical Journal*. 1. 154., pp. 1-8; 1906. "American Football." *British Medical Journal* 1. 2354., pp. 344-45.

[13] Intercollegiate Athletic Association of the United States. 1909. "Proceedings of the Fourth Annual Convention of the Intercollegiate Athletic Association of the United States." New York City. See, for example, p. 39.

[14] Byers, Walter, Hammer, Charles. 1995. *Unsportsmanlike Conduct: Exploiting College Athletes*. Ann Arbor. The University of Michigan., pp. 35-36.

[15] Watterson, John S. 2000. "The Gridiron Crisis of 1905: Was it Really a Crisis?" *Journal of Sport History* 27. 2., 291-298. The NCAA likes to claim that its members control everything. Learned historians disagree. Ronald Smith observes clearly that initially: "The freedom of an individual institution to carry out its own athletic program was not jeopardized by belonging to the NCAA – at least not at first." But he adds: "The early years of the NCAA were, then, a time when a slow process took place, moving from the individualism of institutions to collective control for the good of intercollegiate athletics." Smith, Ronald A. 1990. *Sports and freedom: The rise of big-time college athletics*. Oxford. New York. Oxford University Press., p. 208.

mission."16 As college football became ever more popular, the NCAA's executive directors, weak executive committees, complex structure, and public relations machine sought to retain control over ever increasing revenue, wayward coaches, and jealous university presidents. They guarded their organization's brand, waxed nostalgically about the virtues of amateurism, and built an economic edifice on the backs of students. They were jealous of any competitors. They denigrated attempts by students to gain an autonomy enjoyed by emerging adults.[17] They stared down many lawsuits and appear to have asked on occasion law firms to help shape their rules in ways that mitigated liability.[18] When national and states laws forced them to change, they did the minimum necessary to remain compliant. When they were accused of being a cartel, they laughed off anti-trust law – until they lost the argument.[19] Their administrative structure, as one-time executive director Walter Byers put it, with its "layer upon layer of administrators and managers is designed to obscure responsibility."

> It is difficult even to identify the wily saboteurs who work from inside to subvert real reform. Their determined efforts are facilitated by the very organization of the NCAA – diffused responsibilities, a complicated governance process that lends itself to manipulation and rules upon rules based on abandoned principles.[20]

37. In all of this, the NCAA lost track of their primary obligation, the fact that students rely upon those whom they trust to guide them and protect them. In short, the NCAA lost perspective on risk and harm.[21] And many students will have paid a costly, personal price in terms of their long-term health and future, even as the NCAA sought to avoid lawsuits.

38. To explain why, however, requires more than a mere chronology of what the NCAA did and when. It requires a broader historical analysis of what the NCAA knew or should have known and when about brain injury, latent and immediate, in sports (subconcussion, concussion and worse) and their associated sequelae, particularly in football, but not limited to football. This report is an evidence-based history of neurological medicine, one that shows clearly that throughout its history the NCAA has followed a clear pattern: as an organization, it knew all that it needed to know to warn and protect players from the adverse effects of concussive injury. But the NCAA could have known far more than it did, could have

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[16] Byers, Walter., Hammer, Charles. 1995. *Unsportsmanlike Conduct: Exploiting College Athletes*. Ann Arbor. The University of Michigan., p. 5.
[17] Fram, Nicholas, Frampton, T. Ward. 2012. "A union of amateurs: A legal blueprint to reshape big-time college athletics." *Buffalo Law Review* 60, pp. 1003-1078.
[18] Letter from John S. Black (Swanson, Midgley, Gangwere, Clarke & Kitchin) to David M. Nelson, 26 February 1986, David Nelson Papers, pp. 1-3, p. 3 particularly.
[19] In Re NCAA grant in aid cap antitrust litigation.
[20] Byers, Walter., Hammer, Charles. 1995. *Unsportsmanlike Conduct: Exploiting College Athletes*. Ann Arbor. The University of Michigan., pp. 35-36.
[21] The risk framework outlined by Brand, Kevin P., and Adam M. Finkel. "A decision-analytic approach to addressing the evidence about football and chronic traumatic encephalopathy." In *Seminars in neurology*. Thieme Medical Publishers, 2019 provides a clear illustration of an approach that could be adopted even today and which is resisted.

done much more, and failed miserably whenever it enacted minimal measures to protect students participating in sports. The NCAA changed its conduct exclusively in response to investigations or litigation.

39. Putting NCAA industry records into the context of the history of neurological medicine requires an understanding of the wider and changing landscape of medicine across the whole of the modern (1789-1918), interwar (1918-1945), post-war (1945-1989), and contemporary time periods (1989-Present).[22] To understand what the NCAA knew and should have done to protect the neurological health and safety of students who play college football, it is important to examine brain injury research across the last one-hundred and fifty years and use that research to put the NCAA actions and inactions into medical, scientific, and historical context. Knowledge about brain injuries has changed over time, and in that changing context, it is important to examine what the NCAA did and did not do over time.[23]

VI. BRAIN INJURY SCIENCE THAT SHAPED SPORTS ORGANIZATIONS

40. In general, brain injuries and brain damage have long been recognized as dangerous injuries by clinicians and scientists for generations. Scientific research and clinical observations on brain injury were published steadily from the mid-nineteenth century onwards.[24] Knowledge about these injuries has clearly progressed in the modern era. But beginning in the mid-nineteenth century, doctors, surgeons, and other researchers recognized the immediate effects of trauma to the head and called attention to the dangers of both mild and severe head trauma. They recognized that in the acute phase following a blow to the head, brain injury symptoms could range from mental disturbances without loss of consciousness through to death.[25] Clinicians appreciated, too, that in rarer cases, even a single, seemingly mild blow to

[22] Burnham, John C. 2015. *Healthcare in America: A History*. Baltimore. Johns Hopkins University Press. is a useful account of the broader medical context in which brain injury knowledge was made.
[23] It is well-known that scientific knowledge does change. *See* the classic account by Kuhn, Thomas S. 2012 [1962]. *The Structure of Scientific Revolutions*. Chicago. University of Chicago Press.
[24] Clinicians and historians have made these observations in classic accounts. Courville, Cyril Brian. 1953. *Commotio Cerebri: Cerebral Concussion and the Postconcussion Syndromes in Their Medical and Legal Aspects*. San Lucas Press.; Trimble, Michael R. 1981. *Post-traumatic neurosis: From railway spine to the whiplash*. Chichester. John Wiley & Sons.
[25] In 2016, the NCAA defined a concussion as "a brain injury that is most commonly caused by a blow to the head or trunk, or by the head or body forcefully impacting the ground. Concussions most commonly occur without loss of consciousness. Typically, there are subtle indications that a concussion has occurred, such as the student-athlete shaking his head, stumbling, or appearing dazed or stunned." NCAA *Soccer 2016-2017 Rules*, p. 83. There is nothing different about this definition from the type of concussion which Dr William Bennett described as one "in which not loss of consciousness occurs at all."p. 231. He wrote "Many cases, however, occur that may be accurately described as examples of concussion, in which, the injury being slight, the loss of consciousness may either be so transient as to escape notice entirely, or may not occur at all – a feeling of being "dazed" or confused for a few moments being all that the patient notices, excepting perhaps a temporary sensation of giddiness." p. 232.

the head could have far-reaching consequences and potentially cause long-term neurological impairments.[26] Recurrent brain injuries, doctors had explained by the 1870s, were dangerous and to be avoided.[27]

41. The NCAA was aware of these facts at inception, because one of the advisors that helped found the NCAA was Edward Nichols,[28] the team physician of the Harvard University football team. His published work shows an acute understanding of the nature of concussive injury in football and the need to identify it, mitigate its effects, and treat the patient with conservative care, including hospitalization. The NCAA formally recognized this medical issue in the context of football in its first *Handbook on the Care and Prevention of Athletic Injuries*, which the NCAA copyrighted in 1933.[29]

42. In the late nineteenth century, and in the first thirty years of the twentieth century, clinicians and medical researchers understood that the blow to the head was the cause of brain injury. After World War II, brain injury medicine developed rapidly. From the 1950s to the present, clinicians and medical researchers developed an acute understanding of the complex symptoms, cellular effects, biochemical changes, and physiological processes that arise from mild, moderate, and severe traumatic brain injury. They developed a better picture of the neuroanatomical and neurofunctional disturbances and destruction that occurred as external forces impacted on the head, including a head wearing a football helmet. Over time, science, medicine, and engineering adopted a model describing what happened in biomechanical terms to the brain as a whole as well as the axons, glial cells, and other tissues.[30]

43. Curiously, however, in 1933 the NCAA made a serious effort to keep informed about these issues and had a concussion protocol within its own Medical Handbook that was developed by the three most prominent sports medicine physicians of that time. Even in 1933, that protocol was well-developed and probably effective then, had it ever been implemented, than any of the concussion protocols the NCAA

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[26] See, as one indicator, -- 1892. "The Traumatic Factor in Mental Disease." In D. Hack Tuke, *A Dictionary of Psychological Medicine: Giving the Definition, Etymology and Synonyms of the Terms Used in Medical Psychology with the Symptoms, Treatment, and Pathology of Insanity and the Law of Lunacy in Great Britain and Ireland* vol 2. Philadelphia. P. Blaksiton, Son & Co., pp. 1306-1311.

[27] Browne, James Crichton. 1872 "Cranial Injuries and Mental Diseases" *The West Riding Lunatic Asylum Reports.* 2. p. 128.

[28] Nichols, E.H., Smith, H. B. 1906. "The Physical Aspect of American Football." *Boston Medical and Surgical Journal* 154. 1, pp. 1-8. Commenting on this paper in the *Journal of the American Medical Association* an author of an editorial stated: "Perhaps the most serious feature of these accidents is the number of concussions of the brain reported. Only two games were played during the entire season in which a case of concussion of the brain did not occur. Frequently the fact that a man had received this serious head injury was noted by the surgeon from the sidelines before it was recognized by the player. At times, a man thus hurt continued automatically to go through the motions of playing until his mates noticed that he was mentally irresponsible. When a condition like this develops as a result of an injury, the central nervous system has received a very severe shaking up." Also see: "Surgical Aspects of Football" *JAMA* 13 January 1906, p. 122.

[29] -- 1933. *National Collegiate Athletic Association Medical Handbook: Prevention and Care of Athletic Injuries, Recommendations for Medical Examination, Pre-Season Conditioning, Methods of Training, Diagnosis and Treatment of Injuries.* Princeton, NJ. Princeton University Press.

[30] Casper, Stephen T. 2018. "Concussion: A History of Science and Medicine, 1870-2005." *Headache: The Journal of Head and Face Pain*. doi: 10.1111/head.13288.

demanded of D-1 football programs on 2010. Had the NCAA implemented that protocol as mandatory in 1933 and developed it over time, the NCAA would have likely fulfilled its mission to protect the health and safety of student football players on this issue and properly communicated the short-term and long-term risks they faced from concussive injury in football. But the NCAA never implemented the protocol within the 1933 Medical Handbook. Instead, the NCAA appears to have adopted a policy of inaction, often defensively pointing to debates in medicine as a reason for not offering warning or any concussion protocols at all. Regardless, no debate in medicine about risk assessment ever led responsible clinicians to do nothing, but that is exactly what happened with the NCAA. It did nothing and ignored accepted medical science most likely because other influences within the NCAA (coaches and athletic directors) did not want medical assessments on the sidelines to disrupt a Saturday afternoon spectacle that attracted gate receipts for 65,000 cheering fans.

44. The fact that the NCAA worked so closely in the 1970s with researchers at Wayne State University, famous for their car crash test research, shows that the NCAA recognized that scientific advice and reason were required for the NCAA to understand the risks associated with the use of the hard-shell plastic helmet in football. But the NCAA completely missed the point – no helmet can ever protect a football player from concussive injury – and paid no attention to what some of those researchers were saying about the risks of brain injury in contact and collision sports.[31] This pattern of denial has persisted, most famously in the work of the Mild Traumatic Brain Injury Committee of the National Football League that actively falsified scientific studies financed by the NFL, a fact exposed by careful investigative journalism.[32] The profit-making organizations that oversee sports such as football and ice hockey (the NFL and NHL) have made concerted efforts to downplay, falsify, and paint a confusing picture of the risks associated with brain injury in those respective sports. First, these efforts violate ethical norms. The NFL and NHL essentially lied to the players, past, present, and future, by sowing seeds of doubt about whether

[31] A clear example is a text published by Gurdjian, E. S.; Webster, J. E. 1958. *Head Injuries: Mechanism, Diagnosis and Management*. Boston. Toronto. Little, Brown and Company. They describe the postconcussion and postsubconcussion syndrome. They say that that "subconcussive or concussive blows, with a short period of unconsciousness or none whatever after impact, are the most likely to produce either of the syndromes." They add: "The postsubconcussion syndrome is probably the result of functional and or organic cerebral disturbance due to a subconcussive injury. Minor bruises and petechiae in important areas (subfrontal area, limbic lobe, hypothalamus) may cause confusion, a dazed feeling, and personality disorders despite the absence of any immediate posttraumatic unconsciousness." pp. 313-14. In a separate chapter, the authors say of sporting injuries (acknowledging the punch-drunk syndrome and claiming that boxing may be different from football): "The pathological changes, the diagnostic methods, the symptoms and signs, and the treatment of head injury in sports, aside from boxing, are no different from those of any other head injuries, and are described in detail in other chapters." p. 353.

[32] A journalistic analysis is: Fainaru-Wada, M. and Fainaru, S., 2014. *League of denial: The NFL, concussions, and the battle for truth*. New York. Three Rivers Press. For background, see also the 2019 New York Times: "N.F.L.'s Flawed Concussion Research and Ties to Tobacco Industry" https://www.nytimes.com/2016/03/25/sports/football/nfl-concussion-research-tobacco.html Accessed January 7th, 2019.

medical science had assessed the problem and risks properly. These unethical actions were designed to benefit the owners and organizers of the game of football, including the NCAA. Writing about these issues in general, ethicist and neurosurgeon Grant Gillett, has observed that "vested interest in downplaying [brain injury] are considerable and concentrated in North America where diffuse head injury is a wide spread feature…". He added:

> Concussion in sport seems to be another case where we, as responsible health scientists, are conned by the nay-sayers who are driven by vested financial or other political interests. We have seen this happen in relation to tobacco and cancer, the food industry and cardiovascular disease, and diabetes and obesity, as well as in relation to the diseases strongly correlated with poverty and inequality. In each case, the bleating about lack of convincing evidence in relation to sport and concussion looks to be not the kind of science on which we would normally base policy in delivering good healthcare designed to keep people from harm. Having said that, there is a significant question about how we should act.[33]

VII. THE NCAA WAS WELL-POSITIONED IN 1906 TO ADDRESS BRAIN INJURY IN FOOTBALL

45. In 1906, medical science had advanced to a point where clinicians, medical scientists and educators well understood the far-reaching consequences of concussion and other brain injuries. At this juncture, clinicians, medical scientists and educators understood that the mechanics and injury of concussion had significant adverse effects, some of which involved latent long-term consequences.[34] This required the proper identification, mitigation, and treatment of concussive injury as it happened on fields of play. This issue was well-understood by Edward Nichols, the Harvard Football Team's physician, who famously pulled Harvard's star player Dan Hurley and hospitalized him based on a suspected concussion. Dr. Nichols had published in the *Boston Medical and Surgical Journal* (a journal that was renamed *The New England Journal of Medicine*) the first prospective survey of football injuries in a season at Harvard. This survey had asked players to report injuries, "no matter how trivial."[35] In the section of their report dealing with head injuries, Nichols and Smith observed that "cases of concussion were frequent . . . but two

[33] Gillett, Grant. 2018. "Concussion in Sport: The Unheeded Evidence" *Cambridge Quarterly of Healthcare Ethics*, 27.4., p. 710 and p. 714 respectively.
[34] Historians have noted that a central reason the NCAA came into existence was because of what Emily Harrison has dubbed football's "first concussion crisis." Harrison, E.A., 2014. "The first concussion crisis: Head injury and evidence in early American football." *American Journal of Public Health*. 104. 5., pp.822-833; also see Smith, R., 2017, "Football Concussions and a 1905 "Crazy" Episode: An Early Doctor-Treated Medical Event at Harvard" *Journal of Sports Injuries and Medicine*, Issue 1, 102-103.
[35] Nichols, E.H., Smith, H. B. 1906. "The Physical Aspect of American Football." *Boston Medical and Surgical Journal* 154. 1, pp. 1-8.

games were played during the entire season in which a case of concussion of the brain did not occur."[36] Dr. Nichols commented:

> The mental state of the players who had concussion was variable, some being highly excitable and hysterical, others merely confused, and in a few cases, knocked completely unconscious. In every case there was a certain loss of memory, both previous and subsequent to the injury. The loss of memory previous to the injury varied from a few minutes to a week….Concussion was treated by the players in general as a trivial injury and rather regarded as a joke. The real seriousness of the injury is not certain. Our own experience with the after effects of the cases is not sufficient for us to draw any definite conclusions, but from conversation with various neurologists, we have obtained very various opinions in regard to the possibility of serious after effects.[37]

46. The editors of the *Boston Medical Journal* added: "In every game except two, one or more players suffered from concussion of the brain, the cases being of every grade of severity, from mere hysterical irresponsibility or confusion to complete coma."[38] For the editors, football was more violent than "prize-fighting, cock-fighting, and bull-fighting."[39]Objectionable features of football raised to an outbreak of dissatisfaction long slumbering but none the less intense and sincere. There came a period of agitation and discussion; of some reform and repentance, and of probably improvement in the game of football itself.[40]

47. Thirty-five years of medical research had made clear for the football authorities that to a reasonable scientific certainty blows to the head in football and other sports were dangerous, could have life-long consequences, and were to be avoided.

VIII. THE NCAA 1906-1933.

48. A Harvard study published in 1909 shed light on what could occur at any institution that fielded a football team. The authors stated that in football "concussion of the brain has been frequent". In all cases there was observed memory loss. In some cases, the loss was constant.[41] The authors observed: "It is curious to notice the different degrees of confusion which result from the injury. It often happens that the other players notice nothing wrong with the injured man, although from the side lines his irresponsible

[36] Nichols, E.H., Smith, H. B. 1906. "The Physical Aspect of American Football." *Boston Medical and Surgical Journal* 154. 1., p. 3.
[37] Nichols, E.H., Smith, H. B. 1906. "The Physical Aspect of American Football." *Boston Medical and Surgical Journal* 154. 1., p. 3.
[38] -- 1906. "American Football." *British Medical Journal* 1. 2354., pp. 344-45.
[39] -- 1906. "American Football." *British Medical Journal* 1. 2354., pp. 344-45.
[40] Kemp. James F. 1907. "The Proper Function of Athletics in Colleges and Universities." In Intercollegiate Athletic Association of the United States. "Proceedings of the Second Annual Convention of the Intercollegiate Athletic Association of the United States." New York City. 1-54, p. 35.
[41] Nichols, E. H.; Richardson, F. L. 1909. "Football Injuries of the Harvard Squad for Three Years under the Revised Rules." *Boston Medical and Surgical Journal* CLX. 2., p. 35.

conduct may be evident. A man injured in the head may continue to "line up" for a long series of plays and may automatically go through his assignments, although if questioned he may be unable to tell his name, residence, the day of the week or the name of the opposing team."[42]

49. For reasons like these, the 1909 NCAA delegates responded to the report of the Football Rules Committee harshly. One college president stated that football was doomed "without radical changes" and another said that in some states football might be "treated as a crime". While one outcome of these proceedings was a decision by the NCAA to keep a register of deaths and serious injuries,[43] the record shows that many voices within the NCAA wanted greater change.

50. James Roscoe Day, Chancellor of Syracuse University, cautioned that "If athletics are for the students, they must be not only numerously diversified, but of both a harmless and wholesome character. The lives of the students must not be sacrificed to a sport." He added that any game that killed or maimed many should be eliminated or "excluded from our colleges entirely… the killing of one man a season would be toll which it could not justify…".[44] He closed: "The function of college athletics is to secure to the whole student body the most healthful physical development in the most exhilarating manner for the purposes of a sound and healthy scholarship by adapting and using all manner of exercises and sports; and for the purpose also of inculcating practical moral ideals and the moral uses of the body in the development of manhood."[45] This call for more action went unheeded.

A. Evidence that Head Trauma was a cause of Dementia.

51. On the eve of World War I, the NCAA had good reason for contemplating whether dementia and ALS might be possible hazards of playing football. Shortly after the NCAA began reforming football, publications appeared in the *Journal of the American Medical Association* in 1911 that added further reason for concern about the dangers of head trauma. One, by Bernard Glueck, addressed "traumatic psychoses and post-traumatic psychopathic states" and observed that injuries which produce an "…extensive, diffuse shaking up or shattering of the brain tissue, such as occurs in concussions, or those

[42] Nichols, E. H.; Richardson, F. L. 1909. "Football Injuries of the Harvard Squad for Three Years under the Revised Rules." *Boston Medical and Surgical Journal* CLX. 2., p. 35.
[43] Intercollegiate Athletic Association of the United States. 1909. "Proceedings of the Fourth Annual Convention of the Intercollegiate Athletic Association of the United States." New York City, quotes on pp. 25.
[44] Day, James Roscoe. 1909. "The Function of College Athletics." In Intercollegiate Athletic Association of the United States. "Proceedings of the Fourth Annual Convention of the Intercollegiate Athletic Association of the United States." New York City, quotes on p. 38. Day continued latter in the essay and said that rule changes had resulted in "a march of death." p. 40.
[45] Day. James Roscoe. 1909. "The Function of College Athletics." In Intercollegiate Athletic Association of the United States. "Proceedings of the Fourth Annual Convention of the Intercollegiate Athletic Association of the United States." New York City, pp. 42-43.

which produce extensive pressure on the brain, will be followed by mental disturbances."[46] Glueck observed that "head injuries may be followed by no untoward, immediate symptoms…until later – sometimes weeks and even months later – he begins to show a very noticeable change in his psychic total…He complains of vertigo, pressure sensations in the head, migraine, noises in the ears…" He observed a "chronic psychic changed personality" which belonged to what he and others called "traumatic dementia, or feeble-mindedness."[47] The pathology, Glueck stated, probably occurs with microscopic changes in brain substance, and he outlined five cases that included movement disorders, that sometimes followed the patients' injuries.[48] Reflecting on this case series, Glueck concluded that "…head injuries may have a lasting deleterious effect on the individual…a study of the entire individual's life will reveal a decay of his finer functions of intellect, which stamps him as a chronic psychic invalid."[49]

52. Andrew H. Woods published that same year in the same journal an article that explored the relationship between trauma and symptoms of amyotrophic lateral sclerosis. In five cases, Woods reported trauma that was followed by the symptoms of ALS shortly after the trauma.[50] In 1911, Woods admitted that medical authorities were uncertain whether trauma could be "an etiologic factor" but cautioned that the case histories presented one conclusion - "…a reasonable presumption exists, but no definite proof, that trauma is a proximate (evoking) cause of amyotrophic lateral sclerosis."[51]

B. The Origins of NCAA's First Medical Handbook, 1933

53. When the NCAA held its convention in 1924, it was a very different organization. College football had leapt in popularity on the heels of Red Grange (U. of Illinois 1921-1924) and universities had begun fund-raising campaigns for "memorial" stadiums in honor of those who had made the supreme sacrifice during the World War."[52] Boxing had become an intercollegiate sport.[53] The NCAA was inclined to see the growing revenue positively, but critics expressed concern about growing the business of amateur

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[46] Glueck, Bernard. 1911. "Traumatic Psychoses and Post-Traumatic Psychopathic States." *Journal of the American Medical Association*. LVI. 13., p. 943.
[47] Glueck, Bernard. 1911. "Traumatic Psychoses and Post-Traumatic Psychopathic States." *Journal of the American Medical Association*. LVI. 13., p. 944-945.
[48] Glueck, Bernard. 1911. "Traumatic Psychoses and Post-Traumatic Psychopathic States." *Journal of the American Medical Association*. LVI. 13., p. 945-947.
[49] Glueck, Bernard. 1911. "Traumatic Psychoses and Post-Traumatic Psychopathic States." *Journal of the American Medical Association*. LVI. 13., p. 948.
[50] Woods, Andrew H. 1876. "Trauma as a cause of amyotrophic lateral sclerosis." *Journal of the American Medical Association*. LVI. 25. p. 1876.
[51] Woods, Andrew H. 1876. "Trauma as a cause of amyotrophic lateral sclerosis." *Journal of the American Medical Association*. LVI. 25. p. 1877.
[52] NCAA. 1924. *Proceedings of the Nineteenth Annual Convention.* New York City, p. 33.
[53] NCAA. 1924. *Proceedings of the Nineteenth Annual Convention.* New York City, p. 61.

collegiate sports. The 1929 Carnegie Foundation Report *American College Athletics* described growing conflicts of interest between the colleges' educational mission of and their sports businesses.

54. Athletic injuries loomed:

> …athletic injuries are far more frequent and more serious than should be. Apparently, the high incidence of such injuries and accidents is part of the price paid by certain individuals for the benefits received by themselves and their more fortunate colleagues, although this is no reason for neglecting any means whereby the incidence of such injuries might be lowered.[54]

55. The criticisms derived from official figures. The Carnegie Report cautioned that the: "actual incidence [is higher] because many injuries commonly are unrecorded."[55] "Most physicians will agree that of the injuries that befall athletes, or the conditions that resulted from them, the following may be regarded as serious or potentially serious: chronic sprains that disable for three weeks or more, dislocations, fractures, concussions, collapse, and internal injuries."[56]

56. One focus of the Carnegie Report was football, which the Report viewed as particularly hazardous:

> [a]mong total injuries, concussions show an incidence of about 25 per cent at inter-collegiate football and about 16 per cent at intramural, or more than 23 per cent of 650 serious injuries sustained. So important is concussion, that further light has been sought concerning it. Of all the injuries listed, the most difficult for even the expert and specially trained field physician to diagnose and to treat is concussion. The possible seriousness of concussion is attested by the fact that nearly one-half of the team physicians at the colleges and universities visited in the course of the field work on hygiene of training have observed that concussion, once suffered severely, tends to recur the more easily.[57]

57. At the top, the NCAA focused on revenue, profit, advertising, and the glories of the game. Reform-minded people sought to instigate change. The Carnegie Report noted in its conclusion that commercialism appeared the root evil plaguing collegiate sports.[58]

58. Concussion research from the war years through to the Carnegie Report showed that the NCAA lagged behind in matters of athlete safety.[59] The referenced publications culminated in a 1928

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[54] Savage, H. J.; Bentley, H. W.; McGovern, J. T.; Smiley, D. F. 1929. *American College Athletics.* Boston. The Merrymount Press. pp. 122-123.
[55] Savage, H. J.; Bentley, H. W.; McGovern, J. T.; Smiley, D. F. 1929. *American College Athletics.* Boston. The Merrymount Press. p. 138.
[56] Savage, H. J.; Bentley, H. W.; McGovern, J. T.; Smiley, D. F. 1929. *American College Athletics.* Boston. The Merrymount Press. p. 139.
[57] Savage, H. J.; Bentley, H. W.; McGovern, J. T.; Smiley, D. F. 1929. *American College Athletics.* Boston. The Merrymount Press. p. 142-43.
[58] Savage, H. J.; Bentley, H. W.; McGovern, J. T.; Smiley, D. F. 1929. *American College Athletics.* Boston. The Merrymount Press., p. 306.
[59] See, for example, Geroulanos, Stefanos.; Meyers, Todd. 2018. *The Human Body in the Age of Catastrophe: Brittleness, Integration, Science, and the Great War*. Chicago. University of Chicago Press (especially chapter 4); Howell, C.M.H. 1914. "Trauma in Relation to Certain Aspects of Nervous Disease." *The Lancet*. pp. 302-305; Mott, F.W. 1916. "The Lettsomian Lectures on The Effects of High Explosives Upon the Central Nervous System:

medical report from pathologist Harrison Martland, who characterized the neurodegenerative condition in former boxers as "punch drunk" which in the 1940s came to be called chronic traumatic encephalopathy, now known by its acronym, CTE. Dr. Martland was drawn to study the condition by lay accounts of the symptoms suffered by boxers. Through autopsy of deceased boxers' brains and his personal experience with pugilists, Martland drew the link between blows to the head in a contact sport, multiple punctate hemorrhages seen in pathology reports, and reported clinical symptoms pre-death. Martland coined the term "punch drunk" and provided case studies to test and further develop earlier pathology reports by his contemporaries who had shown some of the same findings in their studies. Martland, in particular, discussed the pathological and neurological observations of Casassa and Osnato and Giliberti.[60]

59. Martland opened his study by observing that a tremendous blow during a boxing fight might appear to initiate the condition. He wrote, "I know of one fight that was stopped by the referee because he thought one of the fighters intoxicated."[61] Punch drunk syndrome was rarely the result of a single blow. Rather it was an occupational disease that resulted from repetitive blows to the head.[62] The symptoms appeared approximately 50 percent of the time in fighters, either in a mild or severe form, and Martland concluded that this "seems to be good evidence that some special brain injury due to their occupation exists."[63] It was obvious that punch drunk syndrome was "due to single or repeated blows on the head or jaw." The pathology was the result of "multiple concussion hemorrhages in the deeper portions of the cerebrum."[64] Martland reported that the relationship between mental disturbance following a concussion was reflected in the extreme pathology in the boxers he studied. He wrote that "…punch drunk bears the same relation to multiple concussion hemorrhages as do many of the postconcussion neuroses and psychoses that follow blows or falls on the head."[65]

60. The significance of Martland's study was that it clarified the risks faced by those who sustained repeat concussions on a regular basis. Martland's prognosis was that repeat concussions, if not stopped, would likely result in degenerative neurological disease.

Lecture II." *The Lancet.* 1. 12, pp. 441-48; *see also* F.W. Mott, *"The Lettsomian Lectures on The Effects of High Explosives Upon the Central Nervous System: Lecture III*," *The Lancet*, (1916), pp. 545-52; Mott, F.W. 1917. "The Microscopic Examination of the Brains of Two Men Dead of Commotio Cerebri (Shell Shock) Without Visible External Injury." *British Medical Journal* 2. 2967, pp. 612-15; Cassasa, C.S.B. 1924. "Multiple Traumatic Cerebral Hemorrhages." *Proceedings of the New York Pathological Society* 24. 101, pp. 101-06; Osnato, M.; Giliberti, V. 1927. "Postconcussion Neurosis - Traumatic Encephalitis. A Conception of Postconcussion Phenomena." *Archives of Neurology and Psychiatry.* 18. 2., pp. 181-214.

[60]Martland discussed the work and findings of Casassa, Osnato, Giliberti, and his own previous work with Beling. Martland, H.S. 1928. "Punch Drunk."*JAMA.* 91. 15., pp. 1103-07.

[61] Martland, H.S. 1928. "Punch Drunk."*JAMA.* 91. 15., p. 1103.

[62] Martland, H.S. 1928. "Punch Drunk."*JAMA.* 91. 15., p. 1103.

[63] Martland, H.S. 1928. "Punch Drunk."*JAMA.* 91. 15., p. 1103.

[64] Martland, H.S. 1928. "Punch Drunk."*JAMA.* 91. 15., p. 1103.

[65] Martland, H.S. 1928. "Punch Drunk."*JAMA.* 91. 15., p. 1107.

61. For all its great originality and importance, decades before Martland published his paper symptoms of punch drunkenness following head injury were reported anecdotally.[66] Martland's research traces back to sports injury research that existed before the NCAA was founded. Martland vindicated these observations,[67] and journalists noted that "'Punch Drunk' May Apply in Other Sports."[68] Even as the NCAA launched intercollegiate boxing in 1924, the news about concussions and latent brain disease had grown more alarming.[69] Nonetheless, the NCAA took five years after Martland's publication to produce a medical handbook that advised about the care of college football players specifically with respect to repeat concussive injury. The NCAA's Medical Handbook of 1933 was a thorough effort to inform those responsible for student safety of the risks of concussions in sports and specifically college football. The Medical Handbook arose from the 1932 NCAA convention proceedings and the discussion on "Athletic Injuries". The discussion included concerns about measuring complete recovery in a concussed player and the player's susceptibility to future concussions: "…the individual is very much more liable to a repeated concussion from blows that normally should have no effect."[70] Dr Edgar Fauver of Wesleyan University, one of the authors of the NCAA 1933 Medical Handbook, noted:

> As a medical man, it is perfectly obvious to me that certain injuries that seem to be rather mild when they occur may show up five, ten, fifteen, or twenty years later and become very much more serious than first expected. That is particularly true of head injuries. A man who has been subjected to various head injuries that might occur in boxing or repeated concussions in football may suffer, five, ten, or fifteen years later rather serious results.[71]

62. Less than a year later, the NCAA's Medical Handbook offered a thorough presentation of the risks of brain injury in football and the proper, precautionary care students deserved.[72]

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[66] Battle, W.H. 1890. "Three Lectures on Some Points Relating to Injuries to the Head: Lecture III." *British Medical Journal.* 2. 1542, pp. 141-47. Duncanson, J.G. 1903. "The Knock-Out Blow On The Point Of The Jaw." *British Medical Journal.* 1. 2205., p. 782-83. 1894. "Outdoor cases of coma." *JAMA*, pp. 243-44.

[67] -- 1929. "Concussion of the Brain, or "Punch Drunk." *JAMA* 92. 4, pp. 314-315.

[68] The Bismarck Tribune (Bismarck, North Dakota). 1928. "'Punch Drunk' May Apply in Other Sports: American Medical Association Publishes Article Raising Question." October 20, p. 10.

[69] It continued to worsen with further publications. Osnato, Michael. 1930. "The Role of Trauma in Various Neuropsychiatric Conditions." *American Journal of Psychiatry* 86 (4): 646-660; and also see Cairns, Hugh, and W. Russell Brain. 1932. "Head Injuries and their Sequels." *The Lancet* 962-963, which included a passage explaining: "Concussion is rarely fatal. Contusion may prove fatal, but is more important as a cause of prolonged disability. In one series of cases of contusion it was found that 10 per cent of the patients were totally incapacitated, and more than half were unable to return to their normal occupations," p. 963.

[70] "Athletic Injuries: Thursday Afternoon Session, December 29, 1932" in *Proceedings of the Annual Convention, 1927-34*, p. 42.

[71] "Athletic Injuries: Thursday Afternoon Session, December 29, 1932" in *Proceedings of the Annual Convention, 1927-34*, p. 47.

[72] -- 1933. *National Collegiate Athletic Association Medical Handbook: Prevention and Care of Athletic Injuries, Recommendations for Medical Examination, Pre-Season Conditioning, Methods of Training, Diagnosis and Treatment of Injuries.* Princeton, NJ: Princeton University Press.

63. The Handbook criticized the failure of NCAA member institutions to pay attention to modern medical knowledge and noted a conflict of interest between protecting the health of students and winning the competitive match.[73] The NCAA's Handbook described the duties of a team doctor, which included: "to advise an inexperienced, untrained student against taking part in activities like distance runs, hard basketball games, football, rowing, etc., to an extent that is detrimental to his welfare and development." [74] Doctors' duties also included evaluating the medical history of the student. The guide warned: "Cerebral concussions causing loss of consciousness, followed by headaches, etc., indicate that competitive sports involving heavy personal contact such as football, wrestling, hockey, lacrosse, etc., should be permitted with great caution and under close supervision, if at all."[75] It noted that when a player has been taken out of a game due to injury, they should be returned slowly because "It is apparent from records that secondary injuries are frequently more incapacitating than are the primary injuries."[76]

64. On head injuries, the NCAA's Medical Handbook was sharp. It warned: "Head injuries, while perhaps not so numerous as others, may be, and often are more severe in their immediate *and remote consequence*. Therefore, in contact games such as football, players should be required to wear a satisfactory helmet and should not be allowed to play without such equipment either in games or practice scrimmages."[77] It also warned: "Head injuries are in a category by themselves and warrant special attention."

65. The NCAA handbook said:

> "concussion of the brain" and "fracture of the skull" are terms utilized daily in the press as diagnoses rendered in automobile accidents. They are likewise often used in the press during a football season. The seriousness of these injuries is often overlooked. When one realizes that "concussion of the brain" should be defined as "bruising of brain tissues" often accompanied with actual bleeding into the tissues, one may realize that the condition should not be regarded lightly.

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[73] -- 1933. *National Collegiate Athletic Association Medical Handbook: Prevention and Care of Athletic Injuries, Recommendations for Medical Examination, Pre-Season Conditioning, Methods of Training, Diagnosis and Treatment of Injuries.* Princeton, NJ: Princeton University Press, p. 8.
[74] -- 1933. *National Collegiate Athletic Association Medical Handbook: Prevention and Care of Athletic Injuries, Recommendations for Medical Examination, Pre-Season Conditioning, Methods of Training, Diagnosis and Treatment of Injuries.* Princeton, NJ: Princeton University Press, p. 8.
[75] -- 1933. *National Collegiate Athletic Association Medical Handbook: Prevention and Care of Athletic Injuries, Recommendations for Medical Examination, Pre-Season Conditioning, Methods of Training, Diagnosis and Treatment of Injuries.* Princeton, NJ: Princeton University Press, p. 16.
[76] -- 1933. *National Collegiate Athletic Association Medical Handbook: Prevention and Care of Athletic Injuries, Recommendations for Medical Examination, Pre-Season Conditioning, Methods of Training, Diagnosis and Treatment of Injuries.* Princeton, NJ: Princeton University Press, p. 24.
[77] -- 1933. *National Collegiate Athletic Association Medical Handbook: Prevention and Care of Athletic Injuries, Recommendations for Medical Examination, Pre-Season Conditioning, Methods of Training, Diagnosis and Treatment of Injuries.* Princeton, NJ: Princeton University Press, p. 27.

The 1933 Handbook continued:

> The first mental process of the brain that disappears after injury is memory – memory for recent events. The actual loss of consciousness occurs only in the more serious concussions. Dizziness of a sense of "daze" is common in slight cases.

The Handbook also stated:

> The examination of a player with a head injury should be undertaken with the patient in a reclining position. He should be questioned as to headache and dizziness and particularly as to his memory of recent events. Questions concerning the game, the name of the opponents, the score, the side which is on the offensive, the yard line and the number of the down are important. Questions on the day of the week, the months and year, etc., are sometimes useful. If the injured can answer all these questions, the concussion cannot be very severe, but before making a decision to let him play, he should be made to stand and run to test objectively for dizziness and loss of balance. Routine tests for nystagmus and Romberg's sign should be made.

66. The NCAA medical handbook attached some advice for return to play decisions:

> If the individual with a head injury can answer the above questionnaire and demonstrates no headache or dizziness subjectively, and if objective tests for dizziness are negative, he may return to play under close observation from the side lines. However, if he fails to answer the questions and shows signs of headache or dizziness, he should be removed from the game. Actual unconsciousness for as long a period as one minute, should preclude further play that day."[78]

67. In a table on concussion near the conclusion of the volume, the guide was explicit about the risks of chronic traumatic encephalopathy. The NCAA medical handbook said:

> *"There is definitely a condition described as "punch drunk" and often recurrent concussion cases in football and boxing demonstrate this."*[79]

68. Yet there were worrying signs that hazards to student safety were growing within the NCAA as the revenues rose. The Football Rules Committee in 1938 worried about the fact that "equipment for the football player has become more and more armor-like in character."[80] The NCAA had engaged in a study by their Equipment Committee which that year had noted "Many people feel that modern headguard not only causes injuries to the opponents but, if ill-fitting, often is a menace to the wearer."[81] They had

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[78] -- 1933. *National Collegiate Athletic Association Medical Handbook: Prevention and Care of Athletic Injuries, Recommendations for Medical Examination, Pre-Season Conditioning, Methods of Training, Diagnosis and Treatment of Injuries.* Princeton, NJ: Princeton University Press, pp. 31-32.

[79] My emphasis. – 1933. *National Collegiate Athletic Association Medical Handbook: Prevention and Care of Athletic Injuries, Recommendations for Medical Examination, Pre-Season Conditioning, Methods of Training, Diagnosis and Treatment of Injuries.* Princeton, NJ: Princeton University Press, p. 35.

[80] NCAA, *The NCAA Proceedings of the Thirty-Third Annual Convention held at Chicago, Ill* (NCAA: 1939) pp. 45.

[81] NCAA, *The NCAA Proceedings of the Thirty-Third Annual Convention held at Chicago, Ill* (NCAA: 1939) pp. 46.

called for cooperation by college and manufacturers, and had noted that many "good judges" considered "modern football armor" regrettable.[82] The 1933 NCAA Medical Handbook was perhaps an answer to such criticism, but the fact that it had taken so long to appear is a prelude to the NCAA's pattern of evasion and denial that became commonplace in the 1960s and afterwards.

IX. THE NCAA AND BRAIN INJURY 1933-1970

A. The NCAA's Committee on Sports Injuries & Safety

69. In 1957 the NCAA created a Committee on Sports Injuries and Safety, a belated furtherance of the NCAA's original intended purpose to protect athletes and perform the responsibilities it had pledged for itself to both the students and schools since 1906.[83] The mission of the new committee was to collect and develop pertinent information regarding the prevention and treatment of sports injuries, disseminate the information to member institutions, recommend policies, standards and rules to protect college athletes, and advise the NCAA's Football Rules Committee, as well as other NCAA rules bodies.[84]

70. It is not completely clear why the committee was founded,[85] but the 1955-56 NCAA Yearbook hinted that the NCAA insurance program was seeing growing premiums.[86] The crisis worsened according to the 1956-1957 NCAA Yearbook, where the NCAA Insurance Committee reported:

> If we estimate the total claims pending, roughly at $8,500, it will be seen that the total amount paid out by the company over the four year period—for claims only—will approximate $150,500, while the total premium income is approximately $149,800. Obviously, no insurance company can live with this sort of a loss ratio. With great misgivings, your Committee was forced to agree to a rate increase from $1.30 to $1.70 per man.[87]

71. The early work of the Committee on Sports Injuries and Safety involved a survey of injuries in football, which commenced in 1958 and continued in 1959. Within the category of injuries to the head

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[82] NCAA, *The NCAA Proceedings of the Thirty-Third Annual Convention held at Chicago, Ill* (NCAA: 1939) pp. 46-47.
[83] NCAA. 1961. Report of the Committee on Sports Injuries and Safety, Concerning Football Injury study for 1958 and 1959, Recommended Athletic Training Room Standards, Use of Ergogenic Aids in Competitive Sports, Welfare of Athletes in Hot Weather. Kansas City.
[84] NCAA. Undated. Preface entitled *National Collegiate Athletic Association Committee on Competitive Safeguards and Medical Aspects of Sports*.
[85] The American Medical Association had become concerned and there had been expressions of worry about a lack of standards for football helmets and also an Athlete's Bill of Right's had been drafted. See Allan J. Ryan, "Organized medicine and athletics: the role of the American Medical Association Committee on Injury in Sports." *The American Journal of Surgery* 98, no. 3 (1959): 325-327.
[86] NCAA. *1955-56 NCAA Yearb*ook, pp. 257-58.
[87] NCAA. *1956-1957 NCAA Yearbook*, pp. 287.

and face, head trauma ranked first, with 58 per cent of head and face injuries involving the whole head. The committee found significant that college players failed to wear mouthguards in 93 per cent of head injury cases, wore face guards in 99 per cent of the cases, and the type of helmet was not indicated in the injury report forms returned.[88] The report, however, never referenced the NCAA's 1933 Medical Handbook, as if it had been forgotten, never updated, and ignored by the NCAA medical advisors who were supposed to rely on it and improve upon it. In the time period between 1933 and 1959, brain injury knowledge continued to advance, particularly with evidence that neurodegenerative disease was sometimes a consequence of exposures to repeat blows to the head.[89] The evidence of immediate problems following a single concussion continued to expand. Explanations for all of these observations were also advanced, especially by noteworthy contributions from physics, which introduced one of the few paradigm shifts that took place in brain injury research with the creation of the shear-strain model. The weight of new evidence that became available to the NCAA from 1933 to 1958 should have shaped the activities of the *NCAA Committee on Sports Injuries & Safety* when it formed. Sadly, it did not.

B. Repeated Brain Injury and Disease, 1933-1959

72. Extensive information on the hazards of repeated brain injuries was available to the NCAA in the years between the publication of its *Medical Handbook* and the creation of its sports injuries committee. The work of Irving Sands in 1935 explored concussion pathology as microscopically numerous punctate perivascular hemorrhagic areas, especially in the brain stem, frontal lobes, and corpus striatum.[90] Sands noted well-known symptoms: headaches, dizziness, fatigability, lack of concentration, impulsiveness, irritability, and indifference,[91] and that parkinsonian syndrome remained a possibility too.[92] Trivial head injury, without even loss of consciousness, may result in a chronic disabled condition,[93] an observation very much in line with Dr. Edgar Fauver's warning at the NCAA's 1932 Convention proceedings.

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[88] NCAA. 1961. Report of the Committee on Sports Injuries and Safety, Concerning Football Injury study for 1958 and 1959, Recommended Athletic Training Room Standards, Use of Ergogenic Aids in Competitive Sports, Welfare of Athletes in Hot Weather. Kansas City. p. 16.
[89] Casper, S.T., 2018. "How the 1950s changed our understanding of traumatic encephalopathy and its sequelae." *Canadian Medical Association Journal*, 190. 5., p.E140-141.
[90] Sands, I.J., 1936. "Anatomic Consideration in Clinical Interpretation of Brain Injuries." *American Journal of Psychiatry*. 92. 4., p.776.
[91] Sands, I.J., 1936. "Anatomic Consideration in Clinical Interpretation of Brain Injuries." *American Journal of Psychiatry*. 92. 4. p. 781.
[92] Sands, I.J., 1936. "Anatomic Consideration in Clinical Interpretation of Brain Injuries." *American Journal of Psychiatry*. 92. 4. p. 782.
[93] Sands, I.J., 1936. "Anatomic Consideration in Clinical Interpretation of Brain Injuries." *American Journal of Psychiatry*. 92. 4. p. 788.

73. The NCAA should have issued that same warning to coaches, athletic directors, trainers and students. It was justified in 1932, 1933, and thereafter by numerous studies that established the causal relationship between head injury and specific neurodegenerative disease. Some of those conditions were called post-concussion syndrome, chronic traumatic encephalopathy,[94] Parkinson's syndrome, and amyotrophic lateral sclerosis.

C. Traumatic encephalopathy and postconcussion syndrome as a consequence of head trauma

74. The term "postconcussion syndrome" was likely first coined in Edinburgh in 1931.[95] A medical student named Russell discussed many states that were a consequence of head trauma, including punch-drunk pathology. He described a familiar state of affairs of "a football [soccer] player" who "is able to continue the game after a head injury and subsequently have no recollection of it." This failure to recall his actions to memory suggested that he had not recovered consciousness in full.[96]

75. The 1934 paper by Israel Strauss and Nathan Savitsky, two New York neurologists refined the understanding of psychological dysfunction in cases where evidence of acute head injury could be shown. These were cases in which an actual injury to the brain had occurred, and mental disturbances had been caused by the blow to the head. Strauss and Savitsky described this condition in 1934 as "traumatic encephalopathy." They limited their findings to cases of actual physical injury to the head and suggested the term "traumatic encephalopathy" in cases in which physiologic disturbances of the cerebral mechanisms are present, though organic lesions could not be demonstrated.[97] They argued that repeat trauma led to neurodegenerative disease (encephalopathy). Saucier repeated this for concussion, described as traumatic encephalopathy in 1955, on the eve of the NCAA's creation of the Committee on Sports Injuries and

[94] Chronic traumatic encephalopathy is a different name for, but not materially different from, "punch drunk" syndrome.
[95] Russell, W.R., 1932. "Cerebral involvement in head injury: A study based on the examination of two hundred cases." *Brain*. 55. 4, p. 583.
[96] Russell, W.R., 1932. "Cerebral involvement in head injury: A study based on the examination of two hundred cases." *Brain*. 55. 4, p. 553. He also said: "The concussed football player often moves his limbs restlessly and talks meaninglessly, and not a few cases of head injury are violent and abusive when seen in the out-patient department. Though in slight injuries the duration of this stage is brief when compared to what may be seen in severe cases, it seems that the condition has the same significance in both types of case. In this stage of irritability, consciousness is not fully recovered and the patients have no subsequent recollection of their actions. It is probable that these irritable states merely represent a stage in the recovery of consciousness. The mental and other higher cerebral functions have not yet recovered, and owing the lack of their control the more primitive and less vulnerable motor activity is running wild," pp. 582-583.
[97] Strauss, I.; Savitsky, N. 1934. "Head Injury: Neurologic and Psychiatric Aspects." *Archives of Neurology and Psychiatry*. 31. 5, p. 954.

Safety.[98] The publications brought into greater focus the cause and effect relationship between concussion, repeated concussions, and neurodegenerative diseases, of which chronic traumatic encephalopathy was one.

D. Chronic traumatic encephalopathy as a consequence of head trauma

76. The NCAA in 1933 had described punch drunk syndrome as a definite possibility of repeated concussions. Evidence justifying that view increased in the 1930s and 1940s with many publications. In a 1934 paper, entitled "Traumatic Encephalopathy ('Punch Drunk') of Professional Pugilists," Harry L. Parker of The Mayo Clinic in Rochester, Minnesota, described three punch drunk boxers. Parker clarified sharply that the punch-drunk boxer should be understood to have developed chronic symptoms through repeated trauma.[99] Like Martland, Parker recognized that the condition could be mild in some, and severe in others.[100] His three cases illustrated that the condition progressed as a consequence of head trauma, symptoms began, worsened, and then continued degenerating after retirement. Parker saw this as an almost unbroken chain of causality and that probability that the disease was connected with his trauma is good.[101]

77. Many other publications in the 1930s echoed Parker's investigations. For example, in 1936, another article entitled "Punch-Drunk" appeared in the *American Journal of Medical Science*. Here, the author Edward Carroll adopted an almost anthropological interest in what he, like Parker and Strauss and Savitsky, also called "traumatic encephalopathy": [102]

> I determined to study "punch-drunk" in its natural habitat, the boxing world. Accordingly, I frequented training quarters, helped examine fighters, and made friends with all sorts of "pugs." I observed declining veterans of the ring, talked with their trainers, and drank beer with their managers. I interviewed sports writers, referees and boxing commission physicians. I sought out reputed "punch-drunks" and studied them to the fullest extent that their feeling of exuberant good health would permit of a medical examination. My knowledge of the subject, then, is based upon the information given me by laymen whose business is a keen study of boxers, and the incomplete observation, over a period of 2 years, of many cases of "punch-drunk."[103]

78. Reflecting on the incidence of the condition, Carroll observed that it was not boxers alone who showed evidence of the disease:

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[98] Saucier, J., 1955. "Concussion: a misnomer." *Canadian Medical Association Journal*. 72. 11., pp.816-20.
[99] Parker, H.L. 1934. "Traumatic Encephalopathy ("Punch Drunk") of Professional Pugilists." *Joural of Neurology and Psychopathology*. 15. 57., p. 20.
[100] Parker, H.L. 1934. "Traumatic Encephalopathy ("Punch Drunk") of Professional Pugilists." *Joural of Neurology and Psychopathology*. 15. 57., pp. 20-21.
[101] Parker, H.L. 1934. "Traumatic Encephalopathy ("Punch Drunk") of Professional Pugilists." *Joural of Neurology and Psychopathology*. 15. 57., p. 28.
[102] My emphasis. Carroll, E. 1936. "Punch-Drunk." *American Journal of Medical Sciences*. 191. 5, p. 706.
[103] Carroll, E. 1936. "Punch-Drunk." *American Journal of Medical Sciences*. 191. 5, p. 706.

> …competent followers of the [boxing] estimate that about 5% of men who remain in the professional ranks for a period of 5 years or more will become definitely punch-drunk. About 60% of fighters remaining in the ring for this period will develop mental and emotional changes which are obvious to people who knew them previously. A few deteriorate to the extent that institutionalization is necessary. *Punch-drunk is said to occur among professional football players also.*[104]

This fact led Carroll to reflect on the duty of his profession:

> It is probable that no head blow is taken with impunity, and that each knock-out causes definite and irreparable damage. If such trauma is repeated for a long enough period, it is inevitable that nerve cell insufficiency will develop ultimately, and the individual will become punch-drunk. The cognizance and investigation of this condition by the medical profession would be a contribution to the neurologic and psychiatric study of traumatic disorders. But a higher end would be the education of layman to the remote dangers incident to repeated minor head traumas. The occurrence of this type of degenerative brain change must be recognized and publicized rather than disregarded and discounted. *It is especially important that athletes entering into competitions in which head injuries are frequent and knock-outs are common should realize that they are exposing themselves not only to immediate injury, but also to remote and more sinister effects.*[105]

79. It is essential to stress Carroll's last sentence. Medical writers, including the NCAA, had been calling attention to the dangers of brain injury in sports, some since the nineteenth century. By the mid-1930s, reputable medical professionals were urging their field to educate lay people about these dangers in contact sports.[106] Still more importantly the notion that athletes entering into competitions should receive full disclosure about the "remote and more sinister effects" of concussion had been clearly articulated in the medical literature.

80. Many other studies of the punch drunk syndrome were published in these years, including a paper that suggested the condition be termed dementia pugilistica.[107] There were also a few publications in the lay-press that show that the medical profession connected directly and clearly the condition seen in boxers with the condition seen in American football players.[108] Such studies culminated in the 1957

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[104] Carroll, E. 1936. "Punch-Drunk." *American Journal of Medical Sciences*. 191. 5, p. 709.
[105] Carroll, E. 1936. "Punch-Drunk." *American Journal of Medical Sciences*. 191. 5, p. 711.
[106] But not just lay people. Football coaches too, see: 17th Annual Meeting of the American Football Coaches Association, December 29, 1937, Dr Eastwood reported that 21 college football players had died between 1931 and 1937. He stated emphatically that "sports demanding personal contact should be eliminated after an individual has suffered one concussion." (p. 25).
[107] See, for example: Millspaugh, J.A., 1937. "Dementia pugilistica." *US Naval Medical Bulletin*. 35. 297, pp. 297-303; Winterstein, Carl E. 1938. "Punch-Drunkenness." *Medical World*. XLIX. 11, pp. 427-428; Will, G. W. "Punch Drunk." *Journal of the Royal Army Medical Corps*. 72. 6, pp. 389-392; Critchley, M., 1949. "Punch-drunk syndromes: the chronic traumatic encephalopathy of boxers." In *Hommage a Clovis Vincent*. Paris: Maloine; Steinhaus, Arthur H. 1951. "Swapped for Medals" *The Journal of the American Associate For Health, Physical Education, and Recreation*, October, pp. 13-14 and 58-60,
[108] "Scully Claims That Football Changes Players Into 'Stumble-Backs', Half-Wits" *Columbia Daily Spectator*, Wednesday, September 29, 1937; Berg, Louis. 1936. "Something on Your Mind "Punch Drunk"." *The Brooklyn Daily Eagle*, November 25: 14; Carver, Lawton. 1947. "Fair or Foul." Journal Gazette (Mattoon, Illinois), October

landmark study by MacDonald Critchley which observed that the condition was characterized by plaques typically seen in pathological studies of senility. Critchley stated clearly that the condition could be understood generally as a form of chronic traumatic encephalopathy, and he hypothesized that it had resulted from multiple minor cerebral contusions, perhaps with pinpoint hemorrhages, later gliosis (reactive change of glial cells) and cortical atrophy.[109] Because of its pathology finding, Critchley's study was highly original. It was a new finding. But it should be noted that ultimately the cause was the same as that identified a few years before in a discussion of traumatic epilepsy at the London-based Royal Society of Medicine: " The "punch drunk" syndrome seems quite clearly to result from multiple minor injuries and in my case [a professional pugilist] it seemed probable that the epilepsy was so caused."[110] Multiple minor injuries, as authors had noted, could occur in football, hockey, and many other NCAA sports. In other words, nothing had changed since the NCAA had published its medical handbook in 1933.

E. Parkinson's syndrome as a consequence of head trauma

81. Martland, in 1928, had observed that the later stages of the punch drunk condition "mimic those seen in diseases characterized by Parkinsonian syndrome."[111] For Martland, and for other clinicians, the presentation of symptoms did not mean that individuals who had experienced head trauma had definitely developed Parkinson's disease. Rather, repeated brain injury had contributed to the development of a brain syndrome with similar symptoms to the disease.

82. In the 1930s, the question of the traumatic origins of Parkinson's disease and related symptomologies were debated. One authority reviewing all published cases over the years concluded in 1934 that cases of trauma could present with Parkinsonian syndrome but not Parkinson's disease, a distinction that made sense to neurologists following the epidemic of encephalitis that had swept the globe in the decade before and that had made the typically rare post-encephalitic parkinsonian state more commonplace in hospitals.[112] In 1935 clinicians reviewing the literature on trauma as a cause of Parkinsonian syndrome described yet another case and characterized the literature as offering extensive

23: 9; and more in keeping with the venacular as well, see: Koken, P. 1939. "Whatz-Dooin! (A Kolum of Korn)." The Van Nuys News (Van Nuys, California), September 28: 6.

[109] Critchley, M. 1957. "Medical Aspects of Boxing, Particularly from a Neurological Standpoint." *British Medical Journal*. 1. 5015, pp. 357-62.

[110] Garland, Hugh G. 1942. "Discussion on Traumatic Epilepsy." *Proceedings of the Royal Society of Medicine*. XXXV, p. 776.

[111] Martland, H.S. 1928. "Punch Drunk." *JAMA* 91. 15., p. 1103.

[112] See Grimberg, L., 1934. Paralysis agitans and trauma. *The Journal of Nervous and Mental Disease*. 79. 1., pp.14-42 for the review. On the epidemic of encephalitis, see: Kroker, K., 2004. "Epidemic encephalitis and American neurology, 1919-1940." *Bulletin of the History of Medicine*. 78. 1., pp.108-147.

differences of opinion and noted there are: "a great many clinicians who think that trauma may be a contributory factor, but not necessarily the direct cause."[113]

83. By 1950 an encyclopedic study, which had gone through three editions in the 1940s, had described the effects of repeated concussions as "traumatic encephalopathy," potentially productive of "paralysis agitans" [Parkinson's disease] and had observed that it occurred, admittedly rarely, "in professional football players."[114] This finding, however, requires appreciation of the distinctions clinicians were drawing between pathological disease processes and the diagnosis of disease.

84. Thus by 1950 the NCAA could have known that the appearance of Parkinson's disease in footballers could be evidence of a Parkinsonian syndrome caused by recurrent head trauma. The condition, while rare, was associated with other degenerative diseases, including dementia.

F. Amyotrophic Lateral Sclerosis (ALS) as a consequence of trauma

85. As has already been detailed in this report, the question of the traumatic factor in ALS had been raised by Woods in 1911 shortly after the NCAA had been founded.[115] The years following Martland's 1928 study of the punch drunk pathology were also marked by further interest in trauma as a cause of ALS.

86. The at the time famous neurologist Smith Ely Jelliffe published an exhaustive case review of the topic in 1935, noting that the causal relationship between bodily trauma and the development of ALS remained indefinite. At the same time, Jelliffe reviewed one case that had come to his attention and sought to place it in context. He wrote that the case offered "an occasion for reporting and the same time affords the opportunity of going over the data relative to the numerous cases on record which show somewhat similar histories followed by the development of an amyotrophic lateral sclerosis."[116]

87. Jelliffe's article was followed by others. Some authors expressed doubts that trauma could result in ALS.[117] Others, while acknowledging that the role of trauma in producing ALS was controversial,

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[113] Bruetsch, Walter L.; Dearmond, Murray. 1935. "The Parkinsonian Syndrome Due to Trauma: A Clinicol-Anatomical Study of a Case." *The Journal of Nervous and Mental Disease.* 81. 5., p. 531.
[114] Wechsler, I. S. 1949. "The Relationship of Brain Injury and Other Organic Brain Diseases." In Samuel Brock ed. *Injuries of the Brain, Spinal Cord, and Coverings: Neuro-Psychiatric, Surgical, and Medico-Legal Aspects.* 3rd edition. Baltimore. Williams and Wilkins Company., pp. 426-427.
[115] Woods, Andrew H. 1876. "Trauma as a cause of amyotrophic lateral sclerosis." *Journal of the American Medical Association*. LVI. 25. p. 1876-77.
[116] Jelliffe, S.E., 1935. "The amyotrophic lateral sclerosis syndrome and trauma." *The Journal of Nervous and Mental Disease,* 82. 5., p. 402. Note that the long review continued on pp. 532-550.
[117] Waggoner, R.W.; Löwenberg, K., 1941. "Role of trauma in amyotrophic lateral sclerosis." *Archives of Neurology & Psychiatry.* 45. 2., pp. 296-303.

connected the onset of the disease to repeated jarring of the tissues (their example was the use of a jackhammer).[118]

88. To summarize the findings of this section, between 1933 and 1957 the NCAA either knew that substantial concerns had been repeatedly raised that multiple degenerative diseases could be brought about by repeated blunt force trauma in the context of sports, amateur and professional. While in some cases the diagnosis of particular diseases was contested and in other cases the evidence remained inconclusive, nothing stood against the NCAA recognizing and warning students that a broad constellation of symptoms, conditions, debility, and fatal diseases were ever more strongly associated with contact sports and occupations in which repeated exposures were common. In any case, once the Committee on Sports Injuries and Safety had been founded, this was all information that should have been collected as part of its mission to prevent sports injuries – not least because football and boxing were major NCAA sports. As the next section of this report shows, the explanations for these medical findings were becoming clearer in brain injury science as well.

G. Brain Injury Science, 1933-1959

89. Until the 1930s pathology researchers and clinicians had dominated brain injury science. The 1930s increasingly saw clinicians with prowess in laboratory sciences, especially physiology. These researchers were making substantial efforts to bring together methods from physiology, biochemistry, and physics to offer more thorough explanations of the after effects of acute and chronic brain injury. Two areas of research standout for particular examination. Firstly, the advance of the shear-strain hypothesis, which would become a dominant paradigm for conceptualizing brain injury in the post-war (i.e. after 1945) period of the twentieth century. Secondly, the emergence of literature, grounded in physiology, that investigated the effects of cumulative concussions and subconcussive hits.

H. The shear-strain hypothesis

90. In 1943 A. H. S. Holbourn, a research physicist in the University Laboratory of Physiology and the Department of Surgery in Oxford explored the biomechanics of impact injuries to the head. His essay produced a model of concussive injuries that expressed the injuries in biomechanical terms, resulting in the now accepted view that concussions are impact acceleration and deceleration injuries, that the damaging forces are caused by linear and rotational acceleration, and that these forces create shear strain across the brain. He began his essay:

[118] Alpers, B.J.; Farmer, R.A., 1949. "Role of repeated trauma by pneumatic drill in production of amyotrophic lateral sclerosis." *Archives of Neurology & Psychiatry*. 62. 2., pp.178-182.

The assumption that there is a mechanics of head injury implies that, when the head receives a blow, the behavior of the skull and brain during and immediately after the blow is determined by the physical properties of skull and brain and by Newton's laws of motion. The most important physical properties of brain are: - (a) its comparatively uniform density. Nerve tissue, blood, and cerebrospinal fluid all have about the same density as water, (b) its extreme incompressibility. Brain substance does not appreciably change its size when subjected to a pressure which is uniform in all directions (a so-called hydrostatic pressure), and the incompressibility is about the same as that of water – it would take, for example, a force of about 10,000 tons to compress the brain to half its volume, (c) Its very small modulus of rigidity. That is to say, the brain offers a very small resistance to changes in shape compared with the resistance it offers to changes in size. For example, every surgeon knows that it takes only a small force on a retractor to produce quite a large deformation of the brain – nothing remotely comparable to 10,000 tons, (d) Compared with the feeble rigidity of the brain the rigidity of the skull is very great. For example, it takes about 1 ton to reduce the diameter of the skull by 1 cm, (e) The shape of the skull and brain are important in deciding the location of injuries, (f) It is reasonable to suppose that the brain behaves like the substances whose properties have so far been studied, and therefore that it is injured when its constituent particles are pulled so far apart that they do not join up again properly when the blow is over. In the case of a substance such as brain, whose modulus of incompressibility (bulk modulus) is large compared with its modulus of rigidity, the amount of pulling apart of the constituent particles is proportional to the shear-strain. (Shear-strain, or slide, is the type of deformation which occurs in a pack of cards, when it is deformed from a neat rectangular pile into an oblique-angled pile.[119]

[119] Holbourne, A.H.S. 1943. "Mechanics of Head Injuries." *The Lancet.* 242. 6267., p. 438.

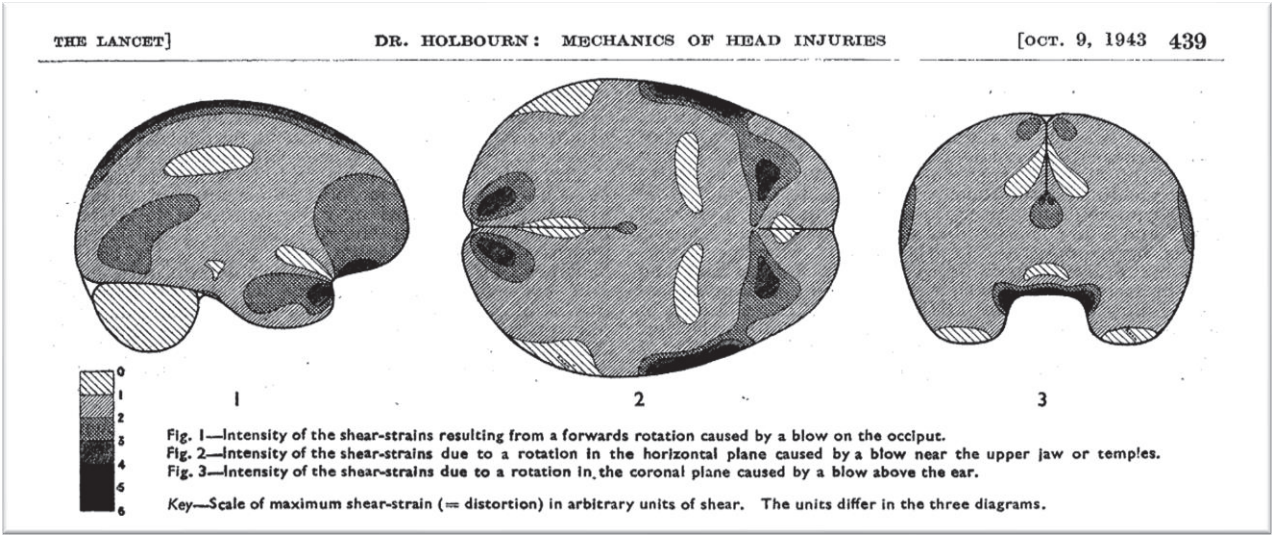

Figure A. In 1943 A. H. S. Holbourne performed an experiment in which he created a gelatin model of the brain. The figure reproduced here is his diagram of a parasagittal section of the brain showing shear-strains produced by rotational force by a blow on the occiput. The gelatin was made in such a way that shear-strains would produce colors making the effect of the force visible.

91. Holbourn produced evidence (Figure A) that it is "the rotational acceleration forces" which "are the main cause of brain injury. That the change in the rotational velocity of the head is likely to cause injury may easily be seen by giving a sudden rotation to the flask full of water."[120] He suggested that contrecoup injuries were probably rotational injuries too. "The distribution of shear-strain in a real brain depends to some extent on factors which are not accurately known."[121] He said:

> …collisions with stationary objects will usually produce more rotational damage than one would expect from the external injury. This is no doubt why it is often said that it makes a difference whether the head or the object causing the injury is in motion – a statement which, taken at its face value, is clearly absurd. For certain directions of blow at certain points of the head – notably points on the midline – a blow, however hard, produces no rotation. In association football, the direction of the ball and the point of the head at which it is "headed" are related in such a way that little rotation is produced by the impact. As an example of the opposite effect, one of the easiest ways of producing a rapid rotation of the head is to strike the chin sideways and upwards. This is the favourite knock-out blow in boxing.

92. Holbourne argued that shear strains were proportional to force in blows of long duration: "Hence one might say, from Newton's second law, that the injury is proportional to the acceleration, or rate of change of velocity of the head. On the other hand, for very short blows the injury is proportional to the force multiplied by the time for which it acts. Hence, from Newton's second law, the injury is proportional

[120] Holbourne, A.H.S. 1943. "Mechanics of Head Injuries." *The Lancet.* 242. 6267., p. 439.
[121] Holbourne, A.H.S. 1943. "Mechanics of Head Injuries." *The Lancet.* 242. 6267., p. 440.

to the change of velocity of the head and not to the rate of change – i.e., acceleration."[122]In conclusion, Holbourne hypothesized that the two main causes of injury are the deformation of the skull and the sudden rotation of the head with shear forces producing the various pathologies described by other authors.

93. The shear-strain hypothesis began to exert an effect on concussion research in the years that followed Holbourne's study, particularly in the advent of the Wayne State Severity Index and the explanation that the model permitted for understanding the spectrum of severity in brain injury.[123] It would also prove highly significant research underpinning the advent of laboratory approaches to standardizing football helmets.

94. Among the early studies that utilized Holbourne's model was the often cited, significant article, by Sabina Strich, that specifically pondered whether damage to nerve fibers in concussion could be irreversible. Strich's investigation analyzed the brains of five patients, four under age 40, who had extremely severe closed head injuries. Using a histological dye that showed myelin damage in black and normal myelin in brown, Strich inferred that:

> closed apparently uncomplicated head injury may be followed by diffuse degeneration of the white matter and consequently may completely and permanently incapacitate the patient. The extreme dementia produced by such a lesion should not be confused with coma, which has different physical signs. The nerve fibre degeneration is not due to cortical cell loss, nor to infarction or laceration of brain substance. Its pathogenesis has not been determined but evidence points to physical damage of nerve fibres at the time of injury as a likely cause.[124]

95. She cautioned: "It is impossible to say whether the nerve fibre damage is at any time reversible and what part, if any, it plays in the production of the signs of concussion, but the possibility that it may play a part should be borne in mind."[125]

96. In other words, based upon this new model of concussion, the NCAA knew or should have known that it was possible that shear-strain of nerve fibers could cause a potentially irreversible conditions, a fact that was augmented by growing literature on the destruction of cells as a result of concussive and subconcussive blows.

I. Research on cumulative concussion and subconcussive blows

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[122] Holbourne, A.H.S. 1943. "Mechanics of Head Injuries." *The Lancet.* 242. 6267., p. 440-441.
[123] See, for a review, Hess, Robert L.; Weber, Kathleen; Melvin, John W. 1980. *Review of Literature and Regulation Relating to Head Impact Tolerance and Injury Criteria*. Report for the Highway Safety Research Institute of the University of Michigan, particularly pages 2-10.
[124] Strich, Sabina J. 1956. "Diffuse Degeneration of the Cerebral White Matter in Severe Dementia Following Head Injury." *Journal of Neurology, Neurosurgery, and Psychiatry*. 19, p. 184.
[125] Strich, Sabina J. 1956. "Diffuse Degeneration of the Cerebral White Matter in Severe Dementia Following Head Injury." *Journal of Neurology, Neurosurgery, and Psychiatry* 19, p.184.

97. As World War II began, many researchers had begun to create models of concussion in animals.[126] As these trends in animal research unfolded, authors began to express concern that damage was found in brains as a result of subconcussive, concussive, and repeated concussive blows.[127] In 1945 two authorities experimentally observed in an animal model a cumulative effect from successive concussions that the argued resulted in neuronal loss.[128] The authors drew two important inferences from their animal studies:

> The rapid clinical recovery from symptoms of uncomplicated brain concussion has led to the suggestion that the condition may be a reversible one. Were it not for the marked changes we have seen in nerve cells after concussion there would be little reason to suspect permanent brain damage. From the cytological point of view it is inconceivable that extreme degenerative changes involving ballooning of the cell and complete loss of Nissl substance can be reversible. Nevertheless no direct proof has been offered that such altered nerve cells die and disappear after concussion. We cannot fully understand post concussional behavioral changes until we know whether structural damage is permanent. The recent report deals with the determination of cell loss in the brain stem after concussion.[129]

In their conclusions, they also said:

> A series of blows [spread out over weeks] appeared to have a cumulative effect. After two light concussions and four severe concussions, each spaced approximately a week apart, in one animal the large interneurons of the reticular formation of the brain stem as well as the large neurons in the lateral vestibular nucleus were reduced in number to less than half found in these groups of the control animal.[130]

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[126] Denny-Brown, Derek, and Ritchie Russell. 1941. "Experimental Cerebral Concussion." *Brain*. 64, 2-3., pp. 93-165. One of the novel contributions of this paper is that the authors accelerated the heads of animals and brought them to a rapid stop, rather than relying upon a hammer (although they did use a hammer sometimes). This they say provides a more realistic model of the type of hits required in concussion. Between two extremes of blows, the authors found a "blow of moderate intensity which causes effects lasting five to ten minutes but with complete recovery." See p. 102. The condition of these animals came close to profound nervous disturbance from trauma to the head. Such examples created brains with some hemorrhagic signs. Repeated blows could also cause death. In their experimental work, the authors found that concussion could not be produced unless the head was allowed to move. They also found that a helmet could reduce the effect of the change in velocity. They decide to call such injuries *acceleration concussion* which they argued was dramatically different from crushing injury. The authors were able to identify many objective signs of concussion in the animal, including changes in deglutination, blood pressure, and heart rate, all of which they are able manipulate differentially with subconcussive, moderate concussive, and strong concussive blows. "Experimental concussion may therefore be defined as the occurrence of an immediate traumatic paralysis of reflex function, which occurs in the absence of visible lesions in the nervous system. Subconcussive blows, on the other hand, depress but do not abolish these reflex functions." See p. 141.

[127] Windle, W. F.; Magoun, H. W. 1944. "Functional and Structural Changes in the Central Nervous System During and After Experimental Concussion." *Transactions of the American Neurological Association.* 70, pp. 117-122.

[128] Windle, W.F.; Groat, R.A. 1945. "Disappearance of nerve cells after concussion." *The Anatomical Record.* 93. 2., at pp. 201-209.

[129] Windle, W.F.; Groat, R.A. 1945. "Disappearance of nerve cells after concussion." *The Anatomical Record.* 93. 2., pp. 201-202.

[130] Windle, W.F.; Groat, R.A. 1945. "Disappearance of nerve cells after concussion." *The Anatomical Record.* 93. 2, at p. 209.

98. To summarize the findings of this section of this Report, between 1933 and 1959 the NCAA knew that evidence was building that the effects of concussion were cumulative and that subconcussive blows were important to consider in the spectrum of brain injury.

J. How Changes in Brain Injury Research Impacted Sports and Sports Research, 1933-1959

99. As has been shown above, authors described the effects of subconcussive blows, concussive blows, repeated concussions, and traumatic encephalopathy as worrying and feared these episodes of injury had caused in some patients subsequent neurodegenerative disease. For those reasons, and more, Carroll's 1936 injunction to the medical profession to educate lay people and athletes about the dangers of blows appears sage advice.

100. In the 1940s it is clear that the NCAA was still paying attention to published studies. The NCAA's Official Boxing Guide from 1944 provides a clear illustration and in several sections. Two chapters in this document describe the remote and delayed risks consequent of head injury. Among these is a chapter entitled "Medical Phases of College Boxing" by Alfred H. Griess is particularly salient. Griess, a clinician and team physician at Penn State College, described concerns arising about boxing and wrote to reassure boxing opponents that college boxing could be safe. Among the arguments that drove Greiss's analysis was the finding that boxing "ranked seventh in college sports programs with an incidence of accidents of 4.6 per 1,000 exposures."[131] In other words, Griess's defense of boxing in colleges was that it was safer than many other NCAA sports, although he admitted that "about 1% received injuries of a serious nature."[132]

101. What kind of injuries were possible? Griess mentioned serious punches to the stomach as concerning, nearsightedness and retinal detachment as problematic, and he also mentioned a single "slugfest" as dangerous.[133] But the majority of his comments he reserved for blows to the head. Writing about their delayed effects, Griess said:

> The consequences of blows to the head may be immediate or delayed. The immediate consequences are unconsciousness or an impaired consciousness known as "grogginess" which last for periods of variable length. Quick recovery is the rule unless hemorrhage in the brain occurs, then recovery is prolonged or the outcome may be permanently disabling of even fatal. Scott found that that concussion of loss of consciousness results from cerebral anemia caused by a rise of intracranial pressure to a level exceeding

[131] Alfred H. Griess, "Medical Phases of College Boxing" in *The National Collegiate Athletic Association Official 1944 Boxing Guide with the Official Rules* edited by Carl P. Shott (A. S. Barnes and Co: New York, 1944), p. 17.
[132] Alfred H. Griess, "Medical Phases of College Boxing" in *The National Collegiate Athletic Association Official 1944*
Boxing Guide with the Official Rules edited by Carl P. Shott (A. S. Barnes and Co: New York, 1944), p. 17.
[133] Alfred H. Griess, "Medical Phases of College Boxing" in *The National Collegiate Athletic Association Official 1944 Boxing Guide with the Official Rules* edited by Carl P. Shott (A. S. Barnes and Co: New York, 1944), p. 19.

> systolic blood pressure. A delayed consequence, "punch drunk," according to Scott's suggestion, is the result of damage to the central nervous system from cumulative anoxemia caused by repeated short lasting anemias. Other authorities contend that a blow or those repeated for a long enough period capable of jarring the brain inside the skill might give rise to punctate hemorrhages with its resultant scar formation causing the individual to become "punch drunk." According to Jokl the pathology of "punch drunk" is unknown because a histological examination of a "punch drunk's" brain has never been made. This condition presents itself in mild or severe form with somewhat characteristics neurological and variable mental symptoms. Fortunately these symptoms rarely progress if the victim is spared further head punishment.[134]

102. Griess noted that "College Boxers" were "seldom "Punch Drunk", which could be construed to mean that the NCAA was aware of exceptions to this claim in 1944. But the condition was worrying enough that he wrote about the condition very carefully.

> The condition of "punch drunk" is not common to amateur or intercollegiate boxers. Cases have been cited to occur among wrestlers, professional football players, victims of automobile or industrial accidents, etc. This pathetic condition may occur in any activity which causes jarring of the brain. Carroll stated that competent followers of professional boxing estimate that about 5% of those remaining in professional ranks for a period of five years of more definitely become "punch drunk." Martland, one of the first to describe this condition, stated that fighters of the slugging type are most often affected because they are usually poor boxers and take considerable head punishment seeking only to land a "knockout" blow. He found it common in second rate fighters used for training purposes who may be knocked down several times a day. Parker stated that "punch drunk" is not so common among successful pugilists who reach their eminence by rapidly disposing of their less expert adversaries with but little injury to themselves. Agile, quick, clever boxers who defend themselves well and take little punishment seem to escape. Jokl gave expert advice when he stated that concussion of the brain must always be regarded as a serious injury and be treated as such, notwithstanding views to the contrary of boxing managers, of many of the boxers themselves, and even of certain medical men who do not base their judgements on the result of medical and especially neurological examinations. He stated further that if treatment is withheld and training and boxing continued, the brain of the fighter must deteriorate. He continued that this holds good in the case of the professional boxer who continues training and fighting without expert medical supervision and consent. Olivercrona is said to have demanded that boxing should be interrupted for at least a year in every case in which a "knockout" blow results in prolonged states of unconsciousness, others advise permanent withdraw from the ring under such circumstances.[135]

103. That advice had clearly shaped the NCAA's 1933 medical handbook. Subsequently, another authority who expressed that advice clearly in the 1950s was Augustus Thorndike. Thorndike was a physician at Harvard University and a founder of the medical subspecialty of sports medicine. He published a review in 1952 in the *New England Journal of Medicine*. It was entitled "Serious Recurrent

[134] Alfred H. Griess, "Medical Phases of College Boxing" in *The National Collegiate Athletic Association Official 1944 Boxing Guide with the Official Rules* edited by Carl P. Shott (A. S. Barnes and Co: New York, 1944), p. 17.
[135] Alfred H. Griess, "Medical Phases of College Boxing" in *The National Collegiate Athletic Association Official 1944 Boxing Guide with the Official Rules* edited by Carl P. Shott (A. S. Barnes and Co: New York, 1944), p. 17-18.

Injuries of Athletes: Contraindications to Further Competitive Participation." In this essay, Thorndike argued that figures with responsibility for safety in organized college athletics had become increasingly aware of their objective duties to young college students.

104. Observing that it was important to understand which recurrent injuries might lead to the "possibility or probability of a permanent disability to mind, body or limb," Thorndike stated that while it was a matter of opinion about how much physicians should allow repeated concussions, he thought it clear that patients "with cerebral concussion that has recurred more than three times or with more than momentary loss of consciousness at any one time should not be exposed to further body-contact trauma. The college health authorities are conscious of the pathology of the 'punch-drunk' boxer."[136]

105. Thorndike added in his conclusions: "Body-contact sports should not be permitted for any student athlete who has suffered removal of the spleen or a kidney, or who has suffered three cerebral concussions of moderate degree, or one concussion, resulting in the diagnosis of laceration of the brain, or loss of an eye."[137]

106. Thorndike's article was treated by other authors as reasonable advice in the decades that followed.[138] In the 1950s and after, Thorndike's views were mainstream across science and clinical research, and there are records indicating that doctors were apprised of this advice and also utilizing it in making determinations about whether high school and college football players should continue to participate in the sport.[139] It is also worth noting that the NCAA's records also indicate that college football in this period was becoming increasingly violent – worryingly so.[140]

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[136] Thorndike, A. 1952. "Serious Recurrent Injuries of Athletes: Contraindications to Further Competitive Participation." *New England Journal of Medicine.* 247. 15, pp. 555-56.

[137] Thorndike, A. 1952. "Serious Recurrent Injuries of Athletes: Contraindications to Further Competitive Participation." *New England Journal of Medicine.* 247. 15, pp. 555-56.

[138] *See*, *e.g.*, McLatchie, G.; Jennett, B. 1994. "Head Injury in Sport." *British Medical Journal.* 308. 6944., pp. 1620-24. Also see the similar recommendation in Bullard, J. A. 1976. "The Dimensions of Responsibility of the Team Physician." *British Journal of Sports Medicine.* 9. 3., pp. 117-21 a paper that discusses the responsibilities of the team physicians, with reference to a university team doctor. The author outlined what is required: the physician should identify completely disqualifying conditions, and included in this is "History of three or more concussions with loss of consciousness." See p. 117.

[139] Gay, James R. 1958. "Trauma of the brain caused by football accidents." *Pennsylvania medical journal.* 61. 7., pp. 883-886 and especially p. 884 for an illustration of the way that football and boxing were connected together and progressive chronic brain disease a concern.

[140] NCAA Football Rules Committee Meeting Minutes from 1950-1960, David M. Nelson Papers, Box 9, Series V.1, Flds 183 and 184.
@ 3293: *'52 Football Rules Committee Resolution* – "Whereas, it appears to the member of the NCAA Football Rules Committee that undesirable trends have developed in our game, affecting sportsmanship and the spirit of fair play, excessively rough play, a tendency to beat the ball, an inclination not to observe the one-second requirement in the shift rule and a lack of respect for the Football Code as published in the Football Rule Book, And Whereas, it is the opinion of the members of the Committee that the football coaches and football officials have contributed to this undesirable trend, the coaches by their failure always to observe the spirit of the rules, and the officials by their failure to enforce the football rules rigidly, Therefore, Be it Resolved, that the Football Rules Committee call upon the coaches and officials to devote their attention more conscientiously and more diligently to the best interests of

107. Safety helmet design provides an illustration. In a 1958 theoretical essay seeking to develop criteria for measuring the performance of helmets, A. G. Gross stated emphatically that the consensus position was that "the primary function of the helmet is to provide protection from brain concussion in case of accidental impact to the head."[141] Describing the physical and mechanical principles at stake in measuring the safety standards of helmets Gross stated:

> Research in the field of brain concussion has, in the past, accordingly been conducted mainly by those trained in the field of medicine. It must be recognized, however, that research dealing with impact to the head involves engineering dynamics, a highly specialized field that is normally foreign to medical research.[142]

108. Gross observed that supposed mechanism of brain concussion was focal violence, which collapsed cavities in the brain and produced the petechial hemorrhagic processes observed by pathologists.[143] For Gross the point about punch drunk boxers was clear enough:

> The well-known "punch drunk" effect suffered frequently by boxers who have taken too many hard blows to the head indicates that the damage to the brain from these successive blows is cumulative in nature. The sectioned brain of a punch-drunk fighter shows small areas of damage dispersed throughout the brain. Such progressive damage may well be caused by minute cavities produced by sub-concussive blows.[144]

109. Gross's article on helmet design makes clear that research on concussions was utilized by authorities across disciplines to conceptualize good helmet design as an effort to prevent the injuries.[145] That Gross's work was pitched at an intersection of biophysical, biomechanical, and pathological principles, and that he mentioned subconcussive blows, also reveals that the broader lessons observable in the historical record up to that point could be absorbed by scientific and clinical investigators in a variety of fields.

110. Whether helmets could actually prevent concussions was another matter (the answer turned out to be no), but the understanding of the short-term and long-term pathological and clinical consequences of repeated trauma, sub-concussive, concussive and worse blows, was by 1958 decades old and the desire to prevent such injuries manifestly wide.

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the game of football and the young men who play, by teaching and enforcing the spirit as well as the letter of the rules."

[141] Gross, A. G. 1958. "A New Theory on the Dynamics of Brain Concussion and Brain Injury." *Journal of Neurosurgery*. 15., p. 548.

[142] Gross, A. G. 1958. "A New Theory on the Dynamics of Brain Concussion and Brain Injury." *Journal of Neurosurgery*. 15., p. 548.

[143] Gross, A. G. 1958. "A New Theory on the Dynamics of Brain Concussion and Brain Injury." *Journal of Neurosurgery*. 15., pp. 552-59.

[144] Gross, A. G. 1958. "A New Theory on the Dynamics of Brain Concussion and Brain Injury." *Journal of Neurosurgery*. 15., p. 559.

[145] See, e.g., -- 1941. "Head Injuries." *The Lancet*, pp. 801-02.

111. These collecting findings continued to shape recommendations for athletes in 1959, when Francis Murphey and James C. H. Simmons, writing at the Department of Neurosurgery at the University of Tennessee College of Medicine published an article in the *American Journal of Surgery*. They noted that Thorndike had suggested in 1952 that three cerebral concussions should bar an athlete and from contact sports. They expressed agnosticism on this recommendation but then offered specific recommendations. For cerebral concussions that rendered athletes "momentarily unconscious or disoriented" they said "without question after concussions any patient ideally should be observed by trained medical personnel for twenty-four hours of more. However, because of the frequency of such injuries and the usual uncomplicated course following them, hospitalization ordinarily is not considered necessary by most physicians. *We disagree with this and always advise hospitalization.*"[146] They added emphatically: "In our opinion, even if no untoward symptoms or signs have occurred after twenty-four hours, these athletes should not engage in contact sports for at least one week."[147]

112. Murphey and Simmons described a second major category which included "those athletes whose loss of consciousness is more than just momentary and those are slow to clear mentally. *This at the very least means some degree of contusion of the brain*." They were even more precise on the subject of concussion. "All such patients should be hospitalized." They recommended that if "recovery is uncomplicated, it is our opinion that such athletes should refrain from participation in any type of sport for at least three weeks."[148] They then described the signs that should result in barring from further sport which included those "who have progressive neurological signs" and they stress that "It is our conviction that no matter how complete recovery may seem, the patient's further participation in contact sports should be prohibited."[149]

113. Even as the NCAA's newly founded Committee on Sports Injuries and Safety had observed that head and face injuries were common, the NCAA took no action on these matters. At its first meeting the NCAA Committee on Sports Injury and Safety recognized they required facts about "injury incidence in intercollegiate sports" and discussed extensively how they should move forward, particularly with concussion, and also in study of the medical literature.[150] But nothing really happened. The NCAA failed to even introduce a basic mouthguard rule. Instead, it created a new category of amateur in this period, the

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[146] Murphey, Francis and James C. H. Simmons, "Initial Management of Athletic Injuries to the Head and Neck" *American Journal of Surgery* 98 (1959), p. 380.
[147] Murphey, Francis and James C. H. Simmons, "Initial Management of Athletic Injuries to the Head and Neck" *American Journal of Surgery* 98 (1959), p. 381.
[148] Murphey, Francis and James C. H. Simmons, "Initial Management of Athletic Injuries to the Head and Neck" *American Journal of Surgery* 98 (1959), p. 381.
[149] Murphey, Francis and James C. H. Simmons, "Initial Management of Athletic Injuries to the Head and Neck" *American Journal of Surgery* 98 (1959), p. 381.
[150] Minutes of the First Meeting of the NCAA Committee on Sports Injury and Safety 17-18 Feb 1958; NCAA_Finnerty_4796235-4796238.

"student-athlete", a legalism that diminished the rights of students hurt in the business of college sports to receive workers' compensation for their injuries.[151]

114. Walter Byers admitted that the NCAA was responding to the threat of litigation and wrote that "…the threat was the dreaded notion that NCAA athletes could be identified as *employees* by state industrial commissions and the courts. We crafted the term *student-athlete*, and soon it was embedded in all NCAA rules and interpretations as a mandated substitute for such words as players and athletes. We told college publicists to speak of "college teams," not football or basketball "clubs," a word common to the pros." [152] That the NCAA never asked why amateur college students who played football might pursue worker's compensation for injuries shows how deeply the NCAA had lost sight of its founding purpose to protect student health and safety on the football field.

K. Brain Injury, Helmets, and the NCAA's Committee on Competitive Safeguards and Medical Aspects of Sports, 1958-1965.

115. In 1965 the NCAA Committee on Sports Injuries and Safety was renamed the Committee on Competitive Safeguards and Medical Aspects of Sports (hereafter CSMAS).[153] In the proceeding years, the NCAA knew of the body of medical knowledge regarding the dangers of repeat concussive events in contact sports generally and football specifically. College boxer Charlie Mohr, the 1959 winner of the John S. LaRowe trophy for best exemplifying "all the attributes of college boxing" had died of head injuries in

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[151] Byers, Walter; Hammer, Charles. 1995. *Unsportsmanlike Conduct: Exploiting College Athletics.* Ann Arbor. University of Michigan Press. p. 69.

[152] Byers, Walter; Hammer, Charles. 1995. *Unsportsmanlike Conduct: Exploiting College Athletics.* Ann Arbor. University of Michigan Press. p. 69. Opining on two cases in particular with favorable outcomes for the NCAA, Byers also wrote: "I wonder what that same court's decision would have been if Ray Dennison, receiving a Big Eight Conference full ride, had died in the 1990 Orange Bowl, as Colorado lost to Notre Dame in a game sponsored by Federal Express for a rights payment of $2,035,411, televised by NBC for $6,150,000, watched by 74,705 spectators who paid $2,140,870 for tickets. The gross take split among the not-for-profit colleges and Orange Bowl committee was $10,765,859." p. 71.

[153] At the Business meeting of 1966 Jerome Holland read the report of the Council. It opened with a broad discussion of the history of the NCAA, pointed to the problem of football safety and noting that the NCAA adopted its present name in 1910. Holland says: "One project the Council looks on with great expectations is the expanded role of the Association's Committee on Competitive Safeguards and Medical Aspects of Sports. During the past year an alliance was formed between the National Athletic Trainers Association, representing the nation's college athletic trainers; the American College Health Association, which represents the team physicians and works in close cooperation with the American Medical Association; and the NCAA representing the coaches and administrators. We anticipate a fine and productive relationship with team physicians and trainers. It is the intention of this group not only to conduct meaningful research but to evaluate the research done by others and, perhaps most important, to disseminate helpful information which should prove extremely beneficial to all concerned with intercollegiate athletics." NCAA. 1966. 1965-1966 Yearbook of the National Collegiate Athletic Association Containing the Association's Year-End Reports and the Proceedings of the Sixtieth Annual Convention at Washington D.C. Kansas and Baltimore., p. 201

January 1961, and the NCAA discontinued boxing as a college sport.[154] At its meeting in January 1961, the NCAA Executive Committee discontinued boxing as one of the National Collegiate Championship Events conducted by the Association.[155]

116. Evidence was also mounting that suggested that safety equipment in football, particularly helmets, were being used in ways that might harm opponents.[156]

117. In keeping with the trends this report has described for the NCAA before 1958, research after that time continued to paint a picture of concussive injuries that suggested they were highly dangerous. In a 1962 review published in the leading medical journal *The Lancet* British neurologist Charles Symonds reviewed the state of the literature. Symonds recalled: "In 1940 I suggested that 'the instantaneous loss of cerebral function so frequently observed after head injury is due to sudden, direct damage, by stretching or compression, to the nerve cells or fibres of the brain.'"[157] How this occurred, Symonds reminded his readers, Holbourne had suggested in 1943 was because of shear strains and rotational forces probably caused both stretching and compression. Animals studies by Denny-Brown and Ritchie Russell published in 1941 also gave solid supporting evidence that "the paralytic phenomena of concussion were due to a direct physical injury to the neurones."[158]

118. Throughout the twentieth-century, Symonds wrote, many authors had sought histological (tissue-level) evidence of damage in experimental concussion. According to Symonds' writing in 1962, "using the Marchi method" in 1913 Jakob had "found as the most constant abnormality diffuse degeneration of nerve fibres."[159] Subsequent authors had:

> found that the amount of damage to the nerve-cells was in proportion both to the number and strength of the blows inflicted. For example, two blows which were subconcussive, as judged by preservation of corneal reflexes, produced as much chromatolysis as a single light concussive blow. These workers justly remark that previous negative reports of histological investigation after experimental concussion do not mean that there were no changes, but simply that the nature of the examination was such that no changes were revealed.[160]

119. Turning to the sequelae of concussion injury, Symonds echoed the findings of many authors throughout the twentieth century:

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[154] Ulrich, Nate. 2010. "Remembering the tragic tale of Wisconsin boxer Charlie Mohr: Wisconsin fighter's death doomer college boxing, created haunting memories for those involved." Times of Northwest Indiana, April 11. For the award, see NCAA, *1959-1960 Yearbook of the National Collegiate Athletic Association*. (NCAA 1960), p. 79.
[155] NCAA, The 56th Annual Convention Bulletin, (NCAA 1962), p. 31.
[156] Dye, E.R., 1959. "Engineering research on protective headgear." *The American Journal of Surgery*. 98. 3., p. 371; 1962. "Mal Stevens Sees, Night Football Boosting injuries: It's Basically a Safe Game." Boston Globe. September 9.
[157] Symonds, C. 1962. "Concussion and Its Sequelae." *The Lancet.* 279. 7219., pp. 1-5.
[158] Symonds, C. 1962. "Concussion and Its Sequelae." *The Lancet.* 279. 7219., p. 2.
[159] Symonds, C. 1962. "Concussion and Its Sequelae." *The Lancet.* 279. 7219., p. 2.
[160] Symonds, C. 1962. "Concussion and Its Sequelae." *The Lancet.* 279. 7219., p. 2.

> The post-traumatic amnesia may be regarded as a symptom of generalized cerebral injury. The other symptoms that are constant enough in a case of moderate or severe concussion are the sequelae – meaning that they continue after the conclusion of the post-traumatic amnesia. These should be considered as a consequence of the initial generalized injury. They are, as we all know, mainly of the subjective kind and they have often been described and analysed. Prominent among them are anxiety irritability, difficulty in sustaining mental concentration, impaired memory and excessive liability to fatigue. These are symptoms of a psychological kind. This does not mean that they have not physical basis, but it does mean that they are related to all those qualities which constitute the patient's personality, and to his whole attitude of mind. Prominent in this will be his attitude towards his illness, its causes and prospects, and the question of compensation.[161]

120. Symonds, moreover, directed attention to the false efforts to imply that structure and function could be separated when it came to neurological and psychiatric symptoms:

> To inquire in such a case whether the symptoms under consideration are functional or organic, psychogenic or physiogenic, is fruitless, for they must always be both. The practical question is not whether there is physical damage, but whether it is still reversible. It is, I think, questionable whether the effects of concussion, however slight, are ever completely reversible. So far as symptoms are concerned, the patient makes a rapid and complete recovery from a single slight concussion, but after repeated episodes there is a gradual appearance of permanent sequelae. The punch-drunk syndrome provides a good example. In these patients who gradually develop the mental symptoms and physical signs of diffuse organic cerebral damage, concussion may never have been severe, but it has been repeated; and in addition there have been frequent subconcussive blows.[162]

121. Again – it is important to reiterated that Symonds was writing about these matters in 1962. He pointed out:

> Other evidence is to be found of cumulative concussive injury in patients who have survived more than one episode of moderately severe degree. I have observed several such cases in which there has been apparently completely recovery after the first episode, but after the second there has been permanent intellectual impairment and personality disorder out of all proportion to the duration of the post-traumatic amnesia on the second occasion.[163]

For Symonds it was also self-evident that the brain damage involved neuronal loss:

> We may therefore surmise that in the patient who has been concussed and recovered, some fraction of his reserve neurons has been lost; and, if the process is repeated, it will only be a question of the number and severity of the injuries before the reserves are exhausted and permanent symptoms appear. The earliest symptoms to be expected from such a diffuse cerebral loss would be of the kind most difficult to measure – subjective difficulty over intellectual problems, and slight personality changes.[164]

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[161] Symonds, C. 1962. "Concussion and Its Sequelae." *The Lancet.* 279. 7219., p. 3.
[162] Symonds, C. 1962. "Concussion and Its Sequelae." *The Lancet.* 279. 7219., pp. 3-4.
[163] Symonds, C. 1962. "Concussion and Its Sequelae." *The Lancet.* 279. 7219., p. 4.
[164] Symonds, C. 1962. "Concussion and Its Sequelae." *The Lancet.* 279. 7219., p. 4.

122. Symonds observed, too, that all of this was likely due to diffuse damage to white matter (the axons of nerve cells in the brain), which as biomechanical theory showed, would be uneven in its distribution.

123. Turning to treatment, Symonds observed that in the past people recommended rest. "The principle is sound; but in practice we observe that many patients after concussion, even of considerable severity, if they are young rapidly become symptom-free: and that there are others whose symptoms persist indefinitely but in disabling degree. Our object should be not only to give the injured brain a long enough rest but to get it working again as soon as possible."[165] Summing up Symonds concluded:

> In the most severe degree of concussion there is widespread irreparable damage. In the slightest degree there may be rapid and complete recovery of cerebral function; but this does not necessarily exclude the possibility that a small number of neurons may have perished – a number so small as to be negligible at the time, but leaving the brain more susceptible as a whole to the effects of further damage of the same kind.

124. Another brain injury study is worth mentioning briefly in comparison with Symonds'. In 1962 Cyril B. Courville published a case study of a verified case of "punch drunk". Courville noted the characteristics that had been described clinically, and noted that one included a "state which resembles parkinsonism" and that "in *dementia pugilistica* a progressive cerebral disorder becomes evident at some interval after the boxing career, and structural changes comparable to those of postencephalitic parkinsonism gradually develop."[166]

125. In addition to such publications on brain injury, there was also increasing research on helmets in sports, and the NCAA knew this research existed. The professed duty of the NCAA's CSMAS was to keep abreast of the latest research and knowledge in sports medicine. If the NCAA did not know the research existed the NCAA was grossly negligent or willfully blind to medical information that the NCAA had to know to fulfill its duty to students who played competitive football.

126. For example, in 1962, the published proceedings of a conference on helmets included one presentation by Stephen E. Reid entitled "Radio Telemetry in a Study of Football Helmets." Reid had observed in his lecture that "the increased incidence in head injuries in football" required researchers to consider whether "the game [football] changed" or whether "modern football helmets [were] inadequate" or both.[167] Reid stated:

> Certainly, the game has changed. Power plays developed in single wing system have been replaced by the speed and deception of the T-formation. The forward pass has become popular since the football has become more elliptical. A man in motion is

[165] Symonds, C. 1962. "Concussion and Its Sequelae." *The Lancet.* 279. 7219., p. 4.
[166] Courville, C. B. 1962. "Punch Drunk." *Bulletin of the Los Angeles Neurological Society*. 27., p. 160 and p. 166.
[167] Reid, Stephen E. 1962. "Radio Telemetry in a Study of Football Helmets." in American Medical Association Committee on the Medical Aspects of Sports, *Proceedings of the National Conference on Head Protection for Athletes Held at Chicago, Illinois*, p. 40.

> allowed to develop speed before the play starts. These changes have produced a wide open game with players running greater distances and developing more momentum. With this emphasis on speed, the game has been taken over by bigger and faster players. The force of impact equals weight multiplied by acceleration but if a football player is able to accelerate to his top speed, as occurs in this wide open modern game – then the energy he has built up is equal to his weight multiplied by the square of his velocity. This faster game magnifies our problem considerably.[168]

The helmet, Reid averred, may have made these challenges worse.

> Twenty-five years ago some football players wore no helmets and relied on their ability to dodge blows to their heads. With improvements in helmets and the addition of the face bar football players today have no fear of head injuries. Larry Onesti, Northwestern's line backer, broke five face guards during the past football season. Some players are even coached to block and tackle by driving their heads directly into their opponents. One may better understand the forces involved if one realizes that a ten-second man is running at a speed of twenty miles per hour and if he collides with an opponent who is moving at the same pace the force of impact is equivalent to striking a stationary object while moving forty miles per hour.[169]

127. In looking at these facts, Reid stated: "There may be a limit to what football helmets can do."[170] He called for research that looked specifically at what helmets encountered in the field and closed:

> I must make this admonishment: This group must not accept any preconceived ideas of head protection in football which have no sound basis. The medical profession is a newcomer in this arena and has wisely chosen this committee to study the medical aspects of sports. The field of head protection involves many professions, and the doctor must be wary in making recommendations on football helmets which may prove to be dangerous. *Gentlemen, we are dealing with the lives of physically superior American youngsters and we must act wisely in our deliberations.*[171]

128. Is there evidence that NCAA was acting wisely in its deliberations where head injury exposure was concerned in the early 1960s? The answer is no. The David M. Nelson Papers include Minutes of the NCAA Football Rules Committee Meeting held in Miami Beach, Florida in early January 1961. The Rules Committee learned that studies had shown that forthcoming publications were going to show that equipment was highly implicated in novel injuries. In response, the Committee decided to

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[168] Reid, Stephen E. 1962. "Radio Telemetry in a Study of Football Helmets." in American Medical Association Committee on the Medical Aspects of Sports, *Proceedings of the National Conference on Head Protection for Athletes Held at Chicago, Illinois*, p. 40

[169] Reid, Stephen E. 1962. "Radio Telemetry in a Study of Football Helmets." in American Medical Association Committee on the Medical Aspects of Sports, *Proceedings of the National Conference on Head Protection for Athletes Held at Chicago, Illinois*, p. 41.

[170] Reid, Stephen E. 1962. "Radio Telemetry in a Study of Football Helmets." in American Medical Association Committee on the Medical Aspects of Sports, *Proceedings of the National Conference on Head Protection for Athletes Held at Chicago, Illinois*, p. 41.

[171] My emphasis. Reid, Stephen E. 1962. "Radio Telemetry in a Study of Football Helmets." in American Medical Association Committee on the Medical Aspects of Sports, *Proceedings of the National Conference on Head Protection for Athletes Held at Chicago, Illinois*, p. 43.

recommend to the Executive Director the creation of a special committee that included representatives from the Sporting Goods Manufacturers and funding for Football Rules to support those activities.[172] At the 1962 meeting of the Football Rules Committee the Special Committee on Injuries and Equipment had decided that "no radical change be made in the football equipment presently used" even though there was substantial pressure from some members of the Football Rules Committee to abolish the facemask and hard-shell plastic helmet.[173] Abolition did not happen, but the FRC did pass Rule 9, Section 1, Article 1 which stated: "A deliberate and malicious act in which the head and helmet are used to strike an opponent's head, neck or face is a personal foul."[174]

129. The context matters. The NCAA knew that players and coaches were using the helmet and facemask as a weapon. Football Rules Committee Chair Ivan Williamson was sufficiently alarmed by this development that he (as Chair of the FRC) sent a memorandum on this subject to every NCAA football coach, conference commissioner, and official that announced that FRC Rule 9, section 1, article 1 was modified to make the use of the helmeted head in football a personal foul that should be flagged as a penalty.[175]

130. By comparison, the American Medical Association had developed a clear communications strategy to improve the safety of high school sports players by publishing a guide about how local medical societies could organize sports injuries conferences in which a large amount of time was dedicated to the problem of head and brain injuries including "the unconscious player" and "the "excited" or "groggy"

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[172] Minutes of the NCAA Football Rules Committee Held at Miami Beach Florida, David M. Nelson Papers, January 13-15, 1961, p. 7. Of note, it seems that David Nelson pursued these matters personally by further seeking film footage of injuries being "caused during play by certain coaching techniques." See Letter from David M. Nelson to L. Combs, 11 December 1961, David M. Nelson Papers.

[173] Meeting of the Football Rules Committee of the NCAA held in Miami Beach, Florida, 15 January 1962, David M. Nelson Papers, p. 4. A 1964 letter sheds light on this platitude. A letter from Fritz Brennecke, Chairman of the Subcommittee on Injuries and Equipment, states: "You may also recall that at the 1962 meeting in Miami Beach there was considerable pressure from some members of the full NCAA Rules Committee that the Subcommittee on Equipment and Injuries recommend modification if not outright abolition, of the plastic helmet and the attached face-mask. Such an action, of course, should only be taken after thorough research and investigation – not as a matter of opinion. Equipment manufacturing companies; colleges; high schools with large inventories of recently purchased helmets; have too much invested to make a radical change unless there is a good reason founded for making it." Elsewhere in the letter, Brennecke complained, "It was the feeling of the members of this subcommittee that if the committee were to function in more than name only, it should give the matter of injuries and fatalities occurring in football as much as study as possible, and that it should submit a report that thoroughly reviewed the effect that present equipment and rules had on prevention or cause of such injuries and fatalities." Letter from Fritz Brennecke to Ivan V. Williamson, 3 April 1964, David M Nelson Papers, pp. 1-3, p. 1.

[174] Memo from The Chairman of the NCAA Football Rules Committee to Intercollegiate Football Coaches, Commissioners and Officials, undated but obviously sent in 1963, because it said "We hope the reports at our 1964 Rules Committee will indicate an elimination of, or at least a great reduction in, the use of the head and helmet for brutally spearing an opponent. **This was true with the above violations and can be the same with this one**." My emphasis because the memo was clearly indicating distinctions between spearing and malicious head attacks.

[175] Ivan Williamson Memorandum, *circa* 1963, found within the David M. Nelson Papers.

player."[176] At an AMA sponsored conference in 1963 Alexius Rachun had lectured on the physical standards for return to competition following injury and had said of head injuries:

> Head injuries involving intracranial structures require separate consideration. Experience has shown that in mild cerebral concussion – the commonest head injury – recovery from symptoms occurs within a few days. Graduate activity is permitted shortly thereafter, and full activity is in about one week following injury. Close supervision is essential. With the more severe concussions, each case is treated individually insofar as returning to competition is concerned. No athlete should be permitted to play until all symptoms and signs of injury are gone.[177]

131. Other authorities were warning about the dangers of head injuries as well. Among them was James V. Cerney, a chiropractor from Dayton Ohio. In 1963 Cerney published a book entitled *Athletic Injuries: An encyclopedia of causes, effects, and treatment.* Cerney stated that he had written the book "in non-technical language" because he had only "the athlete" and the "lay-person" in mind.[178] In a section marked "punch-drunkenness," Cerney wrote that "punch-drunkenness is that recurrent concussion to the brain in any sport resulting in mental inefficiency and irresponsibility."[179] Similarly Lynn O. Litton and Leonard F. Peltier produced a volume entitled *Athletic Injuries* in 1963 as well. They likewise expressed concern about traumatic brain injuries. They took up the matter of post recovery neurological examination, writing: "The major problem in regard to head injuries that faces the coach and team physician is not the management of these very serious and critical injuries, for their nature can be readily appreciated – it is the difficult decision regarding the athlete who has had a head injury with a disturbance of consciousness followed by a complete recovery. Should he be allowed to return to practice, to competition in the next game? How long a recovery period or layoff is necessary? Should he be permitted to return to competition at all?"[180]

132. Admitting the want of clear answers, Litton and Peltier stated:

> Some of the factors to be considered are (1) the degree of the disturbance of normal consciousness, (2) the duration of the disturbance, and (3) the persistence of any signs or symptoms suggesting residual brain damage. The first two factors speak for themselves. The third requires a most careful neurologic evaluation. We believe that if any evidence of residual brain damage is found on the neurologic evaluation the patient should not be allowed to return to competition or participation in contact sports. Persistent headache is an important symptom. If the examination is completely normal and the patient

[176] American Medical Association. 1957?. *Protecting the Health of the High School Athlete: A Guide for Organizing a High School Sports Injury Conference.,* p.10.
[177] Rachun, Alexius. 1964. "Physical Standards for Return to Competition Following Injury." In *Proceedings of the Fifth National Conference on the Medical Aspects of Sports sponsored by the American Medical Association Committee on the Medical Aspects of Sports Division of Environmental Medicine and Medical Services December 1, 1963.* Portland., pp. 51-52.
[178] Cerney, James V., *Athletic Injuries: An Encyclopedia of Causes, Effects, and Treatment* (Springfield, Illinois: Charles C Thomas, 1963), p. viii.
[179] Cerney, James V., *Athletic Injuries: An Encyclopedia of Causes, Effects, and Treatment* (Springfield, Illinois: Charles C Thomas, 1963), p. 663.
[180] Litton, Lynn O. and Peltier, Leonard F. *Athletic Injuries* (Boston: Little, Brown and Company, 1963), p. 41.

> complains of persistent or recurrent headache, he should not be allowed to return to competition of participation. Since each head injury adds an increment to the total amount of brain damage, a patient who has had repeated head injuries, even of a minor nature, may be in serious condition. The "punch drunk" fighter is the classic example. For this reason we feel that any athlete who has had two significant episodes of head injury should not participate further in contact sports.[181]

133. That same argument appeared in the pages of the *Journal of the Maine Medical Association* in 1964 – one of many documents listed in the 1970 *Bibliography of Sports Medicine* which was misplaced and that NCAA knew about these risks:

> *Head injuries:* If a boy has a tendency to be knocked out, he should be eliminated from contact sports. These boys sustain the same injuries to their brain that the boxer sustains when he is knocked out. The final effect of repeated injury to the brain will be the same. This is the type of lad who could very well become a "punch-drunk athlete." A few years ago we had one boy who was knocked out on three successive Saturdays. We advised this boy to give up contact sports which he did. How many times does a boy have to be knocked out for a short period of time before you recommend that he be disqualified or be barred from engaging in contact sports. The answer would have to be a qualified one. The neurosurgeons feel that any boy knocked out three times should be disqualified from contact sports; however, one lengthy period of unconsciousness should also result in medical disqualification.[182]

134. In 1963, as the David M. Nelson papers show, Nelson had received an inquiry from doctor Allan J. Ryan, President of the American College of Sports Medicine, about whether the Football Rules Committee had appointed a physician consultant to the Football Rules Committee.[183] Nelson replied in July 1963:

> It is my understanding that the present N.C.A.A. Rules Committee with eighteen members and Advisory Committees with eleven other members is carrying as large a complement as possible at the present time.[184]

135. In 1963, furthermore, the NCAA's official football rules did no more than chastise students participating in college athletics to obey a football honor code and not seek deliberately to inflict injuries on opponents as such conduct was unsportsmanlike.[185] Meanwhile, the same source also advertised mouthguards but did not mandate them. Apparently, the NCAA was content to collect advertising revenue

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[181] Litton, Lynn O. and Peltier, Leonard F. *Athletic Injuries* (Boston: Little, Brown and Company, 1963), p. 42.
[182] Savastano, A. A. (1964). Physical basis for restriction of participation in sports. *Journal of the Maine Medical Association*, *55*, (1964), p. 146-148; to see where it was listed in Jack C Hughston and Kenneth Clarke, *Bibliography of Sports Medicine* (1970), look at p. 81; for how the bibliography was lost: NCAA Email from Lisa Greer to Randy Dick, June 4, 2003; NCAA Email from Randy Dick to Lisa Greer, David Klossner, and Mary Wilfert, June 4, 2003; for more details see Deposition of David Klossner September 23, 2020 in the matter of The Estate of Cullen Finnerty v. NCAA, part 3, p. 60.
[183] Letter from Allan J. Ryan to David M. Nelson, 17 July 1963, David M. Nelson Papers.
[184] Letter from David M. Nelson to Allan J Ryan, 22 July 1963, David M. Nelson Papers.
[185] 1963. *The Official National Collegiate Athletic Association Football Guide; The Official Rules Book and Record Book of College Football.* New York: National Collegiate Athletic Bureau.

but lacked the appetite to enforce a simple rule that would have further protected students.[186] Images, moreover, appeared in the rules book that seemed to suggest that the NCAA sought to normalize helmet impacts, one entitled "stood up on his head"[187] and another entitled "to cage a cougar" showed a player aggressively leading with his head.[188] It seems clear that by the time the NCAA had created its news letter, the organization's executive leadership were almost entirely focused on college football as big business.[189]

136. At the 59th Annual Convention of the NCAA which took place in 1965, the Committee on Sport Injuries and Safety argued in its report for skepticism about injury data, despite the evident commonality of injuries:

> It is most important, however, for us to remember that, as interested as all of us are in finding ways and means and methods of reducing the incidence of injury in football, we must continue to be equally suspicious of a statistical treatment of this problem because of the subjective nature of any conclusions that may evolve from the data.[190]

Surveys revealed that many injuries were still occurring in games and scrimmages. But some also occurred in fundamentals. Head and face injuries remained common. Indeed, it was noted:

> there is a 10 per cent increase in injury to the head [between presumably 1958 and 1964]. Could this be a result of the teaching of leading with the head in blocking and tackling? Place in rank of frequency naturally does not indicate lack of serious nature, and a blow on the crest of the ilium can be as incapacitating as a badly sprained ankle, as well all know.[191]

137. The author continued: "Although debate still continues in some quarters concerning the plastic helmet and its attached face guard, the American Medical Association tells us that we have, in the plastic helmet, the finest protection of the head yet devised. However, with this protection of the face and head and its consequent psychological elimination of fear of injury in this area of the body, a new element is fast appearing - spearing and goring (for lack of a better term) – leading with the head in all blocking

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[186] -- 1963. *The Official National Collegiate Athletic Association Football Guide; The Official Rules Book and Record Book of College Football.* New York. National Collegiate Athletic Bureau., p. 178.
[187] -- 1963. *The Official National Collegiate Athletic Association Football Guide; The Official Rules Book and Record Book of College Football.* New York. National Collegiate Athletic Bureau., p. 51.
[188] -- 1963. *The Official National Collegiate Athletic Association Football Guide; The Official Rules Book and Record Book of College Football.* New York. National Collegiate Athletic Bureau., p. 56.
[189] -- 1964. "NCAA News." See especially the discussion of the NCAA's television plans, p. 4, and also the fight with the NFL, p. 5.
[190] National Collegiate Athletic Association. 1965. "59th Annual Convention of the National Collegiate Athletic Association: Business Session." Chicago. National Collegiate Athletic Association., p. 290.
[191] National Collegiate Athletic Association. 1965. "59th Annual Convention of the National Collegiate Athletic Association: Business Session." Chicago. National Collegiate Athletic Association., p. 292.

and tackling."[192] The rules committee addressed this problem by suggesting it only mattered if it was done "maliciously" and "deliberately." Otherwise, it was fine otherwise.[193]

138. So while leading researchers were arguing that subconcussive and concussive injuries were dangerous and cumulative, describing the game of football as changed towards heightened risk, and noting that helmets might be limited in terms of what they could do (even if there were better than nothing), the NCAA was advertising mouthguards rather than mandating them and doing a bare minimum about the fact that players were ignoring the honor code and using their equipment to punish opponents. Indeed, the NCAA appeared to glorify the big hits involving the head by including photographs of players leading with their heads or crashing straight down upon them – so long as doing so wasn't deliberate.

L. Brain Injury and the NCAA's Committee on Competitive Safeguards and Medical Aspects of Sports, 1965-1970.

139. The NCAA 1964-1965 By-Laws stated in that "it shall be the duty of the above committees [including the football rules committee] to established and maintain rules of play in their respective sports consistent with sound tradition of the respective sports and of such character as to insure good sportsmanship and healthful participation by the competitors."[194] By September 13th 1965, four college students died in deaths the NCAA recognized were attributable to football and the NCAA scrambled to make a modest rule change about when practice could commence.[195] In November of that same year, Henry Miller, neurologist, at a meeting of the Royal Society of Medicine, London, argued that postconcussion syndrome cannot be evidence of brain damage and is different from chronic traumatic encephalopathy, which he acknowledged as a real disease. Miller speculated that what was really happening was what he termed "accident neuroses." He cited as evidence for this claim his broad experience of thousands of patients with pending or current litigation whom he implied were either malingerers or psychological cases.[196] W Ritchie Russell, already mentioned in this report, was in attendance at the same professional meeting. He retorted to Miller's claims about postconcussion syndrome that there would be considerable

[192] National Collegiate Athletic Association. 1965. "59th Annual Convention of the National Collegiate Athletic Association: Business Session." Chicago. National Collegiate Athletic Association., p. 293.
[193] -- 1965. The Official National Collegiate Athletic Association Football Guide; The Official Rules Book and Record Book. New York. National Collegiate Athletic-Bureau., p. 6 and p. 45.
[194] NCAA. 1965. Constitution of the National Collegiate Athletic Association.
[195] National Collegiate Athletic Association. 1966. 1965-1966 Yearbook of the National Collegiate Athletic Association Containing the Association's Year-End Reports and the Proceedings of the Sixtieth Annual Convention at Washington D.C. Kansas and Baltimore. National Collegiate Athletic Association., p. 215.
[196] Miller, H. 1966. "Mental Sequelae of Head Injury." *Proceedings of the Royal Society of Medicine*. 59., pp. 257-61.

selection bias in drawing any lessons about head injury from a pool of patients with pending or current litigation.[197]

140. Intriguingly, Henry Miller noted in his paper that assessing posttraumatic amnesia in such patients was difficult. He gave an example: "The head-injured footballer" who he said "may finish the game before becoming frankly stuporous."[198] In 1966 C. Miller Fisher described a similar situation. The case was a 41 year old house-wife who had a fall, did not lose consciousness, but became amnesic for ten hours. Contemplating the significance of the patient, Fisher wrote:

> It is commonplace to hear of instances of mild concussion in which the patient is briefly "dazed" without even a brief loss of consciousness. Many anecdotes from football and boxing attest to temporary "confusion" after a head injury yet the victim continued in action. Quigley recorded a remarkable incident from the football field. In 1941, in a Harvard-Yale game on the first play following the kickoff, the quarterback reeled off a series incomprehensible signals, and in the confusion the team was thrown for a loss. This was repeated on the second down. On the third down, one of his teammates recognized the signals as those used four years before in a senior prep school when both played on the same team. It developed that on the kickoff play the quarterback had receive an inobvious blow on the head. By the end of the game, his memory had returned but remained permanently amnesic for the events of the entire game.[199]

141. Fisher recalled that neurologist Macdonald Critchley: "referred to a "groggy state automatism" when the puglist goes on fighting after a knockout but without subsequent recollection thereof. Impairment of "active attention" and incoordinated motor activity were also present. One of our patients, a professional boxer and former world titlist who, on careful assessment showed a significant chronic impairment of memory, insisted that in some fights he could not recall the last 5 or even 10 rounds, although his seconds and other observers had noted nothing amiss."[200]

142. Meanwhile, the NCAA paid little attention to such findings. At a 1966 meeting of the American Medical Association Conference on the Medical Aspects of Sports, Arthur Dickinson, Professor of Physical Education at Arizona State University, and John E. Schramel, Neurologist in Phoenix, Arizona, reported on the incidence of graded concussion in intercollegiate football and recommended that new graded nomenclature for concussion be employed wherever possible in sport medicine and that football players with a history of cerebral concussion should be given "additional protection".[201] In 1967 at the 61st

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[197] Russell, W.R. 1966. "Comment." *Proceedings of the Royal Society of Medicine.* 59., p. 262.
[198] Miller, H. 1966. "Mental Sequelae of Head Injury." *Proceedings of the Royal Society of Medicine.* 59., p. 257.
[199] Fisher, C. Miller. 1966. "Concussion Amnesia." *Neurology* 16., p. 828.
[200] Fisher, C. Miller. 1966. "Concussion Amnesia." *Neurology* 16: p. 828.
[201] Arthur L. Dickinson and John E. Schramel, "Incidence of Graded Cerebral Concussions in Intercollegiate Football" (pp. 75-78, quote on 78) in Proceedings of the Eigth National Conference on the Medical Aspects of Sports sponsored by the American Medical Association Commmitee on the Medical aspects of Sports Division of Socio-Economic Activities, 27 November 1966. Describing the incidence of cerebral concussion, Dickinson and Schramel founded that of 261 recorded concussions, 185 were first degree, 68 were second degree, and 8 were third degree. In other words, they found an incidence of 3% of severe concussions defined as "unconsciousness for prolonged intervals with prolonged period of retrograde amnesia. (p. 75)."

Annual Convention of the NCAA, delegates heard from Fred Allman, a editing contributor to the *Standard Nomenclature on Athletic Injuries* (the text that crafted the graded concussion nomenclature and also listed chronic traumatic encephalopathy as a risk from repeated cerebral injury)[202] who stated to the delegates "progress could be made and nearly complete eradication of tooth loss and the frequency and severity of certain types of concussions immediately by requiring the use of flexible mouthpieces by all athletes engaged in football."[203] As this report has shown, the importance of mouthpieces had been first raised as an issue in 1958 – in keeping with an emergent pattern the NCAA was delayed in enacting even modest changes that would have protected students.

143. Worse, the Executive Committee of the NCAA suggested to the CSMAS that if they required a grant for additional studies of football injuries (which the Executive Committee supported in principle), then they enjoined the CSMAS to submit details to the Executive Committee for review. Rather than empowering the committee with a block grant and the authority to enact meaningful changes in sport safety, the executive committee was getting into the business of making medical decisions rather than listening to medical recommendations.[204]

144. The same was true of spearing. The CSMAS learned of twenty-four fatalities in football in 1966. The committee heard from the authors of the report that "enforcement of the rules prohibiting "spearing," properly fitted helmets, and excellent physical condition are the factors that will help reduce fatalities and serious head and neck injuries resulting from participation in football" and they strongly urged that "spearing" or "goaring" be eliminated from the game.[205] Again, although leading authorities had been drawing this problem to the attention of football authorities, including the NCAA, since 1959, the NCAA only amended the rules in 1967 and in half-hearted language: "The football helmet is for the protection of the player and is not to be used as a weapon."[206] In other words, if it seemed to a coach, trainer, referee or fellow players that the student had not intended to spear, goar, butt, or lead with the head, then there was no violation of the rules.

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[202] American Medical Association. 1976 [1966]. *Standard Nomenclature of Athletic Injuries Prepared by the Subcommittee on Classification of Sports Injuries Committee on the Medical Aspects of Sports of the American Medical Association* 3rd edition. p. 15.
[203] -- 1967. "Proceedings of the 61st Annual Convention of the NCAA." Houston, Texas. National Collegiate Athletic Association., p. 59.
[204] NCAA. Minutes of the National Collegiate Athletic Association Executive Committee (May 4-5, 1967), p. 3.
[205] Blyth, Carl S.; Arnold, David. 1967. *The Thirty-Fifty Annual Survey of Football Fatalities, 1931-1966: Prepared for American Football Coaches Association, Football Rules Committee, National Collegiate Athletic Association, and National Federation of State High School Athletic Associations*. The American Football Coaches Association, p. 2, p. 4, and p. 5 respectively.
[206] —. 1967. The Official National Collegiate Athletic Association Football Guide. 77. Phoenix, Arizona. College Athletics Publishing Service., p. 10.

145. Even as the CSMAS learned that three college students had died in college football,[207] pathologists in 1968 were building on decades of research to show yet again that permanent damage could be inflicted on the brain from a concussion. They had concluded that such injuries, if repeated, would result in progressive, cumulative loss of tissue and of nervous function.[208] At a 1968 conference on protective equipment in sports, clinician Allan J Ryan criticized the notion that a sports injury should be defined by whether it removes the athlete from competition or practice for a day: "Since a repetition of more minor injuries might result in an acute or chronic disability at some point, our interest in discussing the use of protective equipment must extent to cover the effects of these minor occurrences."[209] Unfortunately, these findings and the efforts of the CSMAS to draw them to wider attention within the NCAA failed to result in anything beyond cosmetic.

146. The NCAA Newsletter observed in 1968:

> A statement on the dangers of repeated head injuries in football has been adopted by the NCAA's Committee on Competitive Safeguards and Medical Aspects of Sports. The Committee forwards the statement through the NCAA News to present its findings on such injuries and to warn of the seriousness of allowing players to compete after sustaining a head injury. Committee research showed 25 per cent of all football deaths occurred while a player was competing with a prior head injury. The complete statement follows: The Committee on Competitive Safeguards and Medical Aspects of Sports of the NCAA calls to the attention of all those concerned with the supervision of contact sports the very real and often devastating effects of playing a person who is known to have had a previous serious head injury. In the past three years in organized high school and college football, there have been 12 deaths as a direct result of repeated serious head injury. This is nearly 25 per cent of all deaths associated with organized football. All 12 of these young men had had previous surgery or a previous serious concussion and in spite of this history had been allowed to play again. Athletic directors, coaches, trainers, and team physicians must be doubly cautious in the case of the individual who has had a previous serious head injury or serious concussion. Certainly any athlete who has had previous surgery for a sub-dural hematoma or severe concussion has absolutely no business ever playing football again. Even those individuals who have been rendered unconscious, even momentarily, in a given game should never be allowed to play again the same game and not allowed to return to contact until all symptoms have cleared up entirely and he has been checked by a competent medical authority. In the area of the head and neck, being super cautious is the only route to follow.[210]

147. Other medical professionals were noting the NCAA's irresponsibility. In the same year as the above (1968), a report by the Bureau of Dental Health Education excoriated the NCAA for their

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[207] Blyth, Carl; Arnold, David. 1968. The Thirty-Sixth Annual Survey of Football Fatalities, 1931-1967. The American Football Coaches Association, p. 1.
[208] Oppenheimer, D.R. 1968. "Microscopic Lesions in the Brain Following Head Injury." *Journal of Neurology, Neurosurgery, and Psychiatry* 4, pp. 299-306.
[209] Ryan, Allan J. 1968. "What Injuries in Sports Can be Prevented by the Use of Protective Equipment." In *National Conference on Protective Equipment in Sports*. Madison. University of Wisconsin.
[210] NCAA News "Dangers of Grid Head injuries Cited by Safeguards Committee," Vol 5, No. 8, September 1968, p. 3.

passivity on the safety and health of college students participating in sports. The Council on Dental Health sent the report and a strongly worded letter to the NCAA.[211] Noting (incorrectly as it turned out) that mouth protectors reduced the incidence of concussion, the report said: "The largest remaining athletic organization that does not have a mouth-protector rule is the National Collegiate Athletic Association. There are about 550 football teams among NCAA members, involving more than 33,000 players."[212] It continued: "The most disappointing aspect of the NCAA picture is the great number of players who are still subjected to unnecessary hazards. These figures may seem surprising in view of the fact that all of these players have been required to wear mouth protectors in high school. Therefore, the reason for this drop-off needs to be examined."[213] They continue: "What's bad? Thousands of college players still are not protected against mouth and head injury hazards that have been proved unnecessary. Most of them belong to the National Collegiate Athletic Association."[214] In closing, the report reiterated: "More than 33,000 players are affected."[215]

148. Nothing happened. The CSMAS tried to mandate mouthguards. Internal minutes from a 1969 meeting of the CSMAS show that the effort to make them mandatory could not gain acceptance: "when the resolution by the Joint Commission and Competitive Safeguards and Medical Aspects of Sports, concerning mouth protectors, was presented to the Rules Committee, the mandatory phrase was taken out so that the resolution might meet with more favorable acceptance." It still met with opposition. Further, the CSMAS's member on the Football Rules Committee suggested that the rules be studied and recommended strongly that such things as "spearing" and "mandatory use of mouth pieces" be looked at.[216] Having been given an original mission to gather the best information, to conduct research, and to make recommendations, and having been told for a decade that mouthguards might help with brain injuries, despite overwhelming scientific evidence that brain injuries should be avoided and prevented, the best the NCAA's official football rules for 1969 to 1970 could muster was that "it is recommended that all players wear properly fitted mouth protectors."[217] Even spearing still came with the caveat: "No player shall deliberately and maliciously use his helmet or head to butt or ram an opponent."[218] Spearing without malice or intention was apparently fine.

149. To summarize the findings of this chapter. Despite having recognized:

i. the problem of fatalities involving the head,

[211] NCAA Letter from James M Dunning to National Collegiate Athletic Association, November 14, 1968.
[212] Heintz, William D. 1968. "Mouth Protectors: A Progress Report." September, p. 634.
[213] Heintz, William D. 1968. "Mouth Protectors: A Progress Report." September, p. 634.
[214] Heintz, William D. 1968. "Mouth Protectors: A Progress Report." September, p. 635.
[215] Heintz, William D. 1968. "Mouth Protectors: A Progress Report." September, p. 636.
[216] NCAA, CSMAS Minutes, June 9 1969 Cincinatti, pp. 1-3.
[217] NCAA. undated. *Official Football Rules, 1969-75.* College Athletics Publishing Service, p. 14.
[218] NCAA. undated. *Official Football Rules, 1969-75.* College Athletics Publishing Service, p. 59.

ii. the consequences, including neurodegenerative disease, of repeated injuries to the brain,

iii. that acute brain injuries resulted in shearing injuries and cellular loss,

iv. the commonality of brain injuries,

v. the use of safety equipment in creating risks for further injury, and

vi. the extensive scientific, clinical, and engineering findings that explained clearly what mattered, what standards were needed, why, and offered recommendations about what could be done,

Nothing happened.

150. *What was happening* here by the height of the Vietnam War and the Civil Rights Movement should be put in the sharpest possible terms: college students were not being warned or protected, even as their bodies, minds, and superior athleticism was minutely controlled in almost all other matters. If they failed out of college, or if they were cut from their teams, they could be drafted into a war that had already claimed tens of thousands of lives. The people trusted with that much control of students' bodies, minds, and athleticism, in possession of very powerful tools of coercion, ignored their basic obligation, sound medical information, engineering science, and the moral judgment of the precautionary principle, and resisted mandating even a mere mouthguard. They knew what they were doing. They knew it went against medical advice. They generated vast revenue. They made a choice.

X. THE NCAA AND BRAIN INJURY RESEARCH, 1970-1990

151. In 1967 the National Commission on Product Safety was established in the United States. The subsequent result was the Consumer Product Safety Act of 1972 which sought to reduce "the incidence of product-related injuries, deaths, or serious illnesses."[219] The law applied to all distributed products and granted "unprecedent authority to impose safety standards and other rules" on all "manufacturing and commercial operations related to consumer products." It had the authority to identify and regulate safety

[219] The Bureau of National Affairs, Inc. 1973. The Consumer Product Safety Act: Text, Analysis, Legislative History. Washington D.C. The Bureau of National Affairs, p. 2.

hazards in all products sold to, or used by, the consuming public".[220] The consumer, moreover, had a right to sue for death or disability.

152. Included among those products, as this report will detail below, was safety equipment for amateur and professional sports, and the result was the National Operating Committee on Standards for Athletic Equipment (hereafter NOCSAE), of which the NCAA was a member. At the very first meeting of NOCSAE a delegate observed "that the future of athletics is in jeopardy because of potential lawsuits" while another observed that the American Society for Testing and Materials "was racing to set standards" for helmets, and yet another moved that the new committee "initiate a good public relations program to inform the public about the existence of our Committee and its efforts."[221]

153. In what follows, this report will discuss the way brain injury research unfolded in the period from 1970 to 1990 and the impact that this research had on the NCAA in the context of new laws shaping consumer protection. In general, the pattern remained the same as that in the past. The NCAA and its medical and technical advisory committees struggled to institute changes to rules, mandate equipment, or follow the advice outlined in its own medical handbook. It continued to avoid offering warnings to students that the consequences of repeated brain injuries could be neurodegenerative diseases. It conducted no enforcement action on the failure of its member institutions to follow return to activity protocols following concussion or worse head injuries. The internal documents produced by the NCAA show it increasingly adopted a defensive rather than proactive position to student wellbeing. The threat of lawsuits rather than concerns about student health shaped its practices.

154. Meanwhile, as this report will show, brain injury research continued to highlight the extensive risks of subconcussive, concussive and worse brain injuries. These were not facts ultimately reflected in the revised sports medicine handbook that finally appeared in 1981. Indeed, had the spirit of the 1933 handbook been maintained and its advice enforced, students would have been far better protected than they were.

A. Brain Injury and Disease, 1970-1981

155. Extensive information on the hazards of repeated brain injuries continued to be available to the NCAA during the 1970s. In 1973 J. A. Corsellis, a pathologist, using autopsied brains from boxers, found chronic traumatic encephalopathy in them and noted the presence of tangle formations characteristic of senility. He predicted that while not every punch needed to visibly alter the structure of the brain, one or

[220] The Bureau of National Affairs, Inc. 1973. The Consumer Product Safety Act: Text, Analysis, Legislative History. Washington D.C. The Bureau of National Affairs, p. 1.
[221] NOCSAE Minutes April 28-29, 1970, p. 2.

many of them to the head would eventually leave a mark, which would initiate the early stages of the degenerative nervous disease and become exaggerated with repeated injuries.[222] Such discussions in the medical literature clarify why by the 1970s medical textbooks were describing the dangers of repeated concussions. For example, *Grinker's Neurology* published in 1976, advised medical students:

> The clinical picture of cerebral concussion is, therefore, not a simple one. The usual patient loses consciousness briefly, soon recovers and thereafter is without symptoms. It seems likely, however, that although the patient appears to make a complete recovery from one such episode, he cannot hope to do so from repeated ones. The repeated traumatization of nerve cells, such as Windle and his associates have shown, is likely to produce a lasting deficit sooner or later. It is probable that this fact accounts for the change seen in prizefighters who become "punchdrunk." Definite changes take place in the brains of some fighters.[223]

156. The concern about neurodegenerative diseases following blunt force trauma was not restricted to chronic traumatic encephalopathy alone. An epidemiologist, reviewing the pathogenesis of Parkinsonism, stated in 1973 that "there are a number of reports in the literature concerning the possible relationship to parkinsonism to antecedent cerebral or peripheral trauma," although he admitted that "the insidious onset and protracted courses of Parkinson's disease make it difficult to evaluated the temporal sequence between dates of onset and putative cause."[224] Similar observations were made about ALS in 1975 in the *Handbook of Neurology*:

> The debate on the medico-legal aspects of the traumatic origins of amyotrophic lateral sclerosis and the related legal problem of compensation is periodically resumed on occasion of a new case. Most physicians recognize a role of trauma under the conditions defined above of chronological sequence, topographical relationship between the site of the trauma and the onset of the neurological disorder. The semiological features discussed above afford supplementary presumptive evidence if they are present. Should a causal role of trauma be admitted then there is a right to compensation.[225]

157. Two further studies in 1977 and 1980 clarified the picture of ALS and noted that trauma and injury might be antecedent to the onset of ALS, although the authors of the 1980 study admitted the cases were few and trauma could be coincidental.[226] Another case-control comparison on the epidemiology of ALS appeared in 1980 and the authors found that "men dying of ALS more often had a history of injury

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[222] Corsellis, J.A. et al. 1973. "The aftermath of boxing." *Psychological Medicine*. 3, pp. 270-303.
[223] Vick, Nicholas A. 1976. *Grinker's Neurology*. 7th edition. Springfield. Charles C. Thomas., p. 651.
[224] Kessler, Irving I. 1973. Parkinson's Disease: Perspectives on Epidemiology and Pathogenesis. *Preventative Medicine* 2, p. 100.
[225] Bonduelle, M. 1975. "Amyotrophic lateral sclerosis." In: Vinken P. T., Bruyn G. W. eds. *Handbook of Clinical Neurology*. *Volume 22: System disorders and atrophies, part II*. North-Holland, Amsterdam, p. 329.
[226] Rosati, G., Pinna, L., Granieri, E., Aiello, I., Tola, R., Agnetti, V., Pirisi, A. and De Bastiani, P., 1977. "Studies on epidemiological, clinical and etiological aspects of ALS disease in Sardinia, Southern Italy." *Acta Neurologica Scandinavica.* 55. 3., see specifically pp.237-238; Juergens, S.M., Kurland, L.T., Okazaki, H. and Mulder, D.W., 1980. "ALS in Rochester, Minnesota, 1925–1977." *Neurology*, 30. 5., see specifically p. 469.

fifteen or more years before death than did the controls during the same period."[227] In 1981 authors of a prospective study of 538 hospital admissions with head injury found noteworthy persisting difficulties in patients and stated that these observations lend weight to the observation that the effects of concussion, however slight, might not be completely reversible.[228] In that year, another study published further support that mechanical trauma and repeated mechanical trauma would anticipate the occurrence of ALS.[229]

158. Other studies relevant to the NCAA appeared on the biomechanics of brain injury. In 1974 neurosurgeons hypothesized that shearing took place in head injuries. They produced a flow chart on the mechanics of head injury and the areas where sufficient experimental research has been done to formally test. They also identified areas where further research was still needed (Figure B). The chart is an impressive document because it captures how mature brain injury research was by the 1970s. The authors, importantly, hypothesized that the biological response to cerebral concussion was post-traumatic sequelae. They noted further observational work needed to be done to clarify whether primary lesions lead to the formation of secondary lesions, initiating degenerative changes.[230]

159. In many respects, all of these studies expanded and developed further upon knowledge that had been disseminated frequently across the decades and available to the NCAA. But the period 1970 to 1981 also saw epidemiology research published which helped to illustrate how wide-spread and worrying concussive injuries were. The National Institute of Neurological and Communicative Disorders and Stroke published in 1980 an estimate based on surveys of population in 1974. The authors found approximately 204 instances of head injury per 100,000 population, with 15-24 most commonly effected, and male rates "twice that for females."[231] The economic costs of head injury were high. The authors estimated:

> For the total population in 1974, direct-care plus indirect costs associated with HSCI [head and spinal cord injury] were approximately $2.6 billion ($4.2 billion in 1980 dollars), an average of $2,715 ($4,408 in 1980 dollars), an average of $2,715 ($4,408 in 1980 dollars) per injured person. The cost of head injury in 1974 was $2.4 billion ($3.9 billion in 1980 dollars), an average of $2,534 ($4,114 dollars in 1980 dollars) per injured person…"[232]

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[227] Kurtzke, J. F., abd Beebe, G. W. 1989. "Epidemiology of amyotrophic lateral sclerosis: 1. A case-control comparison based on ALS deaths." *Neurology,* 30, p. 461

[228] R.W. Rimel et al. 1981. "Disability Caused by Minor Head Injury." *Neurosurgery* 9. 3., pp. 221-28.

[229] Kondo, K. and Tsubak, T. 1981. "Case-Control Studies of Motor Neuron Disease. Associate with Mechanical Injuries." *Archives of Neurology*. 38, pp. 220-226.

[230] Ommaya, A. K.; Gennarelli, T.A. 1974. "Cerebral Concussion and Traumatic Unconsciousness: Correlation of Experimental and Clinical Observations on Blunt Head Injuries." *Brain*. 97. 1., pp. 633-54.

[231] Kalsbeek, W. D., R. L. McLaurin, B. S. Harris, and Miller. 1980. "The National Head and Spinal Cord Injury Survey: Major Findings." *Journal of Neurosurgery*. 53 Supplement, p. S22.

[232] Kalsbeek, W. D., R. L. McLaurin, B. S. Harris, and Miller. 1980. "The National Head and Spinal Cord Injury Survey: Major Findings." *Journal of Neurosurgery*. 53 Supplement, p. S29.

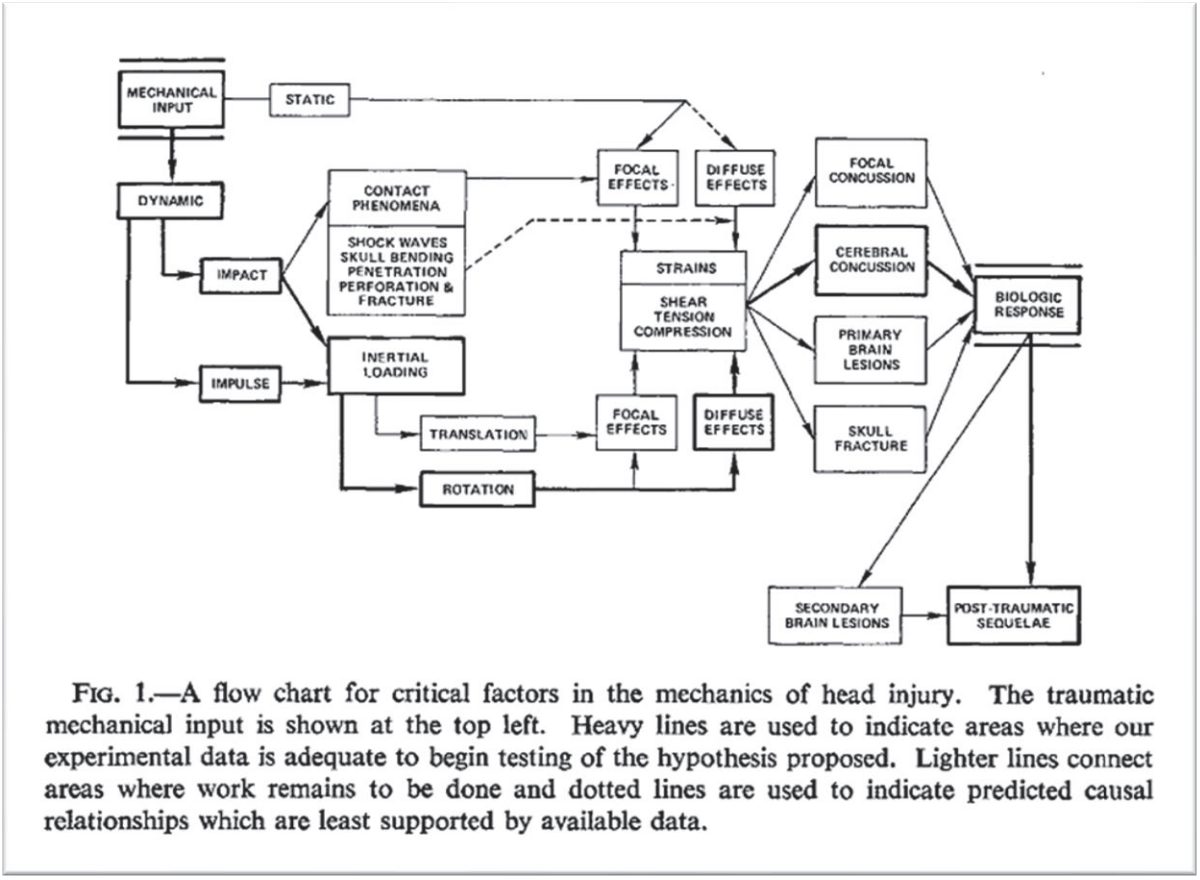

FIG. 1.—A flow chart for critical factors in the mechanics of head injury. The traumatic mechanical input is shown at the top left. Heavy lines are used to indicate areas where our experimental data is adequate to begin testing of the hypothesis proposed. Lighter lines connect areas where work remains to be done and dotted lines are used to indicate predicted causal relationships which are least supported by available data.

Figure B. A 1974 flow chart and caption showing hypotheses that had been tested or needed to be tested in the study of brain injury. The diagram provides evidence that extensive scientific investigation had by then taken place.

160. Another epidemiological survey examined the morbidity and mortality of head injury in Olmsted County, Minnesota. On the topic of repeated head injuries, a concern highly relevant to the NCAA, the authors asked:

> Are persons who have had a head injury at high risk of a second? We were able to determine the observed and expected numbers of subsequent head injuries among subjects who survived. Each patient was followed from the head injuries that led to inclusion in our series as an Olmsted County incidence case. If there was a history of a prior head injury, the patient was followed up for a third or later head injuries. The expected number was calculated by application of injury incidence rates – for age, sex, and decade of study – to the person-years of observation from the first injury to the date of subsequent injury or last follow-up. After one head injury, the incidence rate became about three times greater than before, and after a second injury it increased to eight times that in the general population.[233]

[233] Annegers, John F, Jack D. Grabow, Leonard T. Kurland, and Edward R. Laws. 1980. "The Incidence, Causes, and Secular Trends of Head Trauma in Olmsted County, Minnesota, 1935-1974." *Neurology* 30, p. 916.

B. Brain Injury Research and Sports Medicine, 1970-1981

161. The legacy of research described in the section above clearly influenced sports medicine researchers. Richard Schneider, an expert on football injuries and frequent confidant of the NCAA's CSMAS and also of NOCSAE, observed in 1973 that for players with "one severe concussion" that was sufficient to warrant exclusion "from playing any more football."[234] He also observed in that petechial hemorrhages appeared to cause chronic traumatic encephalopathy.[235] Schneider's book was among those documents that the NCAA "lost" from its Main Library. It was part of the Sport Sciences Collection.[236]

162. Up to the 1970s no author had specifically made such euphemisms as "dings" or "bell-ringers" a focus of research, although one neurosurgeon from Bryn Mawr in 1965 had stated that "Head Injuries in football are usually "subconcussive"".[237] Yet in the same year as Schneider made his observation on severe concussion, Yarnell and Lynch pointed out that "ding" injuries in college football could have disturbing amnesic cognitive effects:

> A professional football player turned author, Dave Meggyesy, has defined being "dinged" as "getting hit in the head so hard that your memory is affected, although you can still walk around and sometimes even continue playing. You don't feel pain, and the only way other players or the coaches know you've been dinged is when they realize you can't remember the plays.[238]

163. Yarnell and Lynch's report included a case worth quoting at length:

> An 18 year old left-handed flanker back was gang tackled after catching a pass on a "91 curl pattern." He got up and started to run to the sidelines, pointing to his head, but was told to stay in the game. On the subsequent play he was confused regarding the signals and had to ask for specific instructions. He then left the game. On immediate testing he had intact orientation and recent memory for the play and impact. Seven minutes later he began to have difficulty remembering the plays, and by 11 minutes after injury he was confused about any of the game events, including his finger dislocation of 90 minutes earlier. He appeared bewildered and continually repeated, "I can't remember, I can't remember; this has never happened to me before." However he was able to do simple arithmetic, reverse spelling, and follow commands. He showed no focal neurologic deficit on screening examination that included ocular, speech and facial muscle function

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[234] It is worth noting that Schneider utilized a less conservative measure of concussion severity. CF with Blazina, M.E., Joanne Carlson, G. and Drake, E.C., 1974. "Head injuries in athletics." *The Journal of Sports Medicine*, *2*(1), p. 51; Schneider, Richard C. 1973. *Head and Neck Injuries in Football: Mechanisms, Treatment, and Prevention.* Baltimore. Williams & Wilkin, p. 165.

[235] Schneider, Richard C. 1973. *Head and Neck Injuries in Football: Mechanisms, Treatment, and Prevention.* Baltimore. Williams & Wilkin, p. 32.

[236] NCAA Email from Lisa Greer to Randy Dick, June 4, 2003; NCAA Email from Randy Dick to Lisa Greer, David Klossner, and Mary Wilfert, June 4, 2003; for more details see Deposition of David Klossner September 23, 2020 in the matter of The Estate of Cullen Finnerty v. NCAA, part 3, p. 60.

[237] Van den Noort, Gordon, "Recognition and Early Management of Head and Neck Injuries in Football" in *Proceedings of the Seventh National Conference on the Medical Aspects of Sports sponsored by the American Medical Association Committee on the Medical Aspect of Sports Division of Socio-Economic Activities* (AMA: Philadelphia, PA, 1965), p. 18.

[238] Yarnell, P. R.; Lynch, S. 1973. "The "Ding": Amnestic States in Football Trauma." *Neurology*. 23, p. 196.

> and gait, strength and coordination testing. The player remained confused for at least 30 minutes postinjury. He was not able to recall his locker combination to obtain his clothes. Beginning at this time, however, his memory started to return, and he could recall being admitted to the Student Health Service. By two and one-half hours postinjury, he was bright and lucid. His memory then included the play and the impact on which he had gotten "his bell rung" and had wanted to leave the game and the following play with confusion regarding the signals; but he had only a vague, patchy recollection of the one-half hour of bewilderment on the sidelines.[239]

164. Yarnell and Lynch's short report was hardly a definitive statement on the topic, and as has been shown above in this report automaticism was known and had been observed, but the condition that they saw in their case study was nevertheless one pointing to significant brain disturbance. This report foreshadowed the emerging sports medicine guidelines that warned by the mid-1980s that even "dings" and "bell ringers" were brain injuries.[240] It is also likely the driver that led the chiropractor James V. Cernay to remark in his 1976 book *The Prevent-System for Football Injuries* that "No helmet minimizes trauma to the brain!"[241]

165. Prior to the 1970s, reputable medical authorities had long called for caution and warned of the potential risks of brain injuries obtained in sporting incidents. They had urged others in their field to educate and warn the lay public of these risks. Further medical guidelines for managing concussion in sports appeared in 1973, in an article on pre-season examinations in football. In this article, the authors, Clayton, Hamlin and Lewis, offered explicit recommendations that were to cover all groups of players, from pee wees to professionals. To assess players and the risks they faced from head injury, Clayton *et al.* provided the following grading scale for concussion:

> Cerebral Concussion Acute 1st Degree (mild) Symptoms: No loss of consciousness; variable symptoms of temporary memory impairment, mental confusion, unsteadiness, tinnitus and/or dizziness. Signs: Perhaps none; or appearance of brief period of mental confusion. Acute 2nd Degree (moderate) Symptoms: Transitory unconsciousness (up to 5 minutes) with retrograde amnesia; variable symptoms of mental confusion, tinnitus and headaches. Signs: Appearance of transitory unconsciousness state and subsequent mental confusion. Acute 3rd degree (severe) Symptoms: Unconsciousness for prolonged interval (more than 5 minutes) with prolonged period of retrograde amnesia; variable symptoms, but of greater duration than those experienced in mild or moderate types; possible convulsions. *Signs:* Appearance of prolonged unconscious state and subsequent mental confusion. [242]

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[239] Yarnell, P. R.; Lynch, S. 1973. "The "Ding": Amnestic States in Football Trauma." *Neurology*. 23, p. 196.
[240] Gennarelli, T.A. 1986. "Mechanisms and pathophysiology of cerebral concussion."*Journal of Head Trauma Rehabilitation.* 1. 2., p. 24; *see also* Sports Medicine Committee of the Colorado Medical Society, *Guidelines for the Management of Concussion in Sports* (June 1991); also Report of the Quality Standards Subcommittee. 1997. *Practice Parameter: The Management of Concussion in Sports (Summary Statement)*. *Neurology* 48. 3., pp. 581-85.
[241] Cerney, James V. *The Prevent-System for Football Injuries* (Prentice-Hall: New Jersey, 1976), p. 61. See also, "Millions in lawsuits hit sport manufacturers" *Des Moines Sunday Register*, 26 December 1976, 3D. "Firms Drop Liability Insurance" *Palm Beach Post*, 5 January 1977, D9.
[242] M.L. Clayton, *et al*. 1973. "Football: The pre-season examination." *Journal of Sports Medicine* 1. 4., p. 20.

166. In a concise and practical management-oriented statement that echoed earlier cautions by Thorndike and others, Clayton and colleagues were very clear that players should not be allowed to return to play if they had three severe concussions or other neurological contraindications. They stated:

> It is our conclusion that a player who has suffered three or more 2nd or 3rd degree cerebral concussions has reached a point of "diminishing returns." That is, he has reached the point where each subsequent concussion increases the possibility of permanent damage to the individual. For this reason, after his third 2nd or 3rd degree concussion he should be excluded from competition.[243]

167. Blazina, Carlson, and Drake in 1974 offered similar guidelines, remarking on a variety of findings that could be assessed at the bench. Beyond an experience of being "momentarily dazed," they suggested that players not be returned to the same game (Figure C). "Seeing stars" they deemed a reason to exclude athletes from further contest on that day. They also indicated that cerebral concussions could occur without a loss of consciousness, offered three grades of concussion for determining concussion severity, and indicated that players should not be permitted to return to practice or competition until symptoms had resolved. For what they termed second degree concussions, they indicated that "athletes" should not be let "participate in sports at this time if he has had a significant period of unconsciousness."[244]

[243] M.L. Clayton, *et al*. 1973. "Football: The pre-season examination." *Journal of Sports Medicine* 1. 4., p. 20.
[244] Blazina, M.E., Joanne Carlson, G. and Drake, E.C., 1974. "Head injuries in athletics." *The Journal of Sports Medicine*. 2. 1., pp. 51-56.

Head Injuries

Findings	Return	No Return
1. Unconscious ("10 second count")	—	×
2. Saw stars or colors (may indicate precortical blow)	—	×
3. One side of body feels numb	—	×
4. Momentarily dazed	?	?
5. Dizzy	—	×
6. Severe headache	—	×
7. Abnormal pupils	—	×
8. Amnesia	—	×
9. Disoriented	—	×
10. Lethargic	—	×
11. Hyperirritable	—	×

Once he is on the bench, the assessment continues.

Head Injuries

Considerations
Be on the alert for other injuries, especially neck injuries.
If athlete is unconscious and concomitant cervical spine injury may have occurred, treat him as if he had a neck injury until he can be questioned.
If a player is only momentarily dazed and has absolutely no other findings, the team physician may consider returning him to the game.
However, if there are any other findings, he absolutely should not be returned to the game.

Figure C. A checklist for return-to-competition.

168. Such return to activity guidance made a great deal of sense in the context of on-going research in the 1970s. A roundtable discussion in the journal *The Physician and Sports Medicine* published in 1974 reiterated the principle. Neurosurgeon Ayub Ommaya stated: "…two concussions are enough to prohibit collision sports, because after the second concussion the brain has taken enough. I would not advise anybody to carry on after two knockouts in boxing, because I have studied this problem sufficiently to see that a real knockout damages the brain. We have evidence now of significant structural damage to the brain with even one knockout."[245]

169. Later neuropsychological studies provided further evidence of the wisdom of these guidelines and recommendations. In a neuropsychological study of twenty young adults published in *The Lancet*, Gronwall and Wrightson found significant cumulative effects from brain injury:

> Twenty young adults were studied after a second concussion. The rate at which they were able to process information was reduced more than in controls who had been concussed only once, and they took longer to recover than the controls. The effects of concussion seem to be cumulative, and this has important implications for sports where concussion injury is common.[246]

[245] -- 1974. "Round Table: Concussion and Head Injuries." *The Physician and Sports Medicine*. October., p. 49.
[246] Gronwall, D.; Wrightson, P. 1975. "Cumulative Effect of Concussion." *The Lancet*. 306. 7943, pp. 995-97. These authors published numerous articles showing similar effects. *See* Gronwall, D.; Wrightson, P. 1974. "Delayed Recovery of Intellectual Function After Minor Head Injury." *The Lancet*. 304. 7881, pp. 605-09; Gronwall, D.; Wrightson, P. 1980. "Duration of Post-Traumatic Amnesia After Mild Head Injury." *Journal of Clinical Neuropsychology*. 1., pp. 51-60; Gronwall, D.; Wrightson, P. 1981. "Memory and Information Processing Capacity After Closed Head Injury." *Journal of Neurology, Neurosurgery and Psychiatry.* 44. 10., pp. 889-95.

170. Gronwall and Wrightson were well-grounded in contemporary medical and scientific trends in brain injury research. They acknowledged, for example, that some authorities persisted in ascribing the post-traumatic syndrome to psychosomatic disorder. Their findings, however, led them to offer several hypotheses, ranging from recoverable injury to the brain to permanent damage. In either scenario, the result remained: "The capacity to process information rapidly is reduced immediately after concussion. We have shown that the reduction is significantly greater and lasts significantly longer when the patient has been concussed before."[247] Ultimately, they were sufficiently worried by their findings to abruptly conclude:

> Whatever the mechanism for this fall-off in intellectual performance, *doctors do have a duty to convince the controlling bodies and participants in sports* where concussion is frequent that the effects are cumulative and that the acceptance of concussion injury, though gallant, may be very dangerous.[248]

171. Perhaps unsurprisingly, such strident language in *The Lancet* did result in an editorial response that questioned whether there was clear evidence that sports other than boxing caused an irreversible "traumatic encephalopathy."[249] The anonymous author of that editorial went on to claim that there was evidence that boxing was much more dangerous than other sports. The author added, however:

> The possibility of lasting damage [in other sports] seems to have been investigated only in an unpublished inquiry by J. A. N. Corsellis. Two years ago 165 British neurologists co-operated in replying to a questionary in which Corsellis asked whether they had ever encountered a condition resembling the punch-drunk state either in boxers or in sportsmen of any category. Professional soccer was mentioned five times with comments on two: one man was a "[soccer] centre half much given to heading and able to do so even if the ball were blasted at him from about six yards". Another had played until he was forty, developed fits, and was thought to belong to the punch-drunk group. Two amateur rugby football players were suspected: one was a young school teacher who had developed a tremor and an impaired memory. Some sharp general comments were made about the risks of chronic brain damage in rugby which ranged from "of course not" from a Welsh neurologist to "I am very suspicious of some top class rugby players but have

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[247] Gronwall, D.; Wrightson, P. 1975. "Cumulative Effect of Concussion." *The Lancet*. 306. 7943, pp. 995-97.
[248] My emphasis. Gronwall, D.; Wrightson, P. 1975. "Cumulative Effect of Concussion." *The Lancet*. 306. 7943, p. 997. Gronwall and Wrightson quoted Roberts, A. H. 1969. *Brain Damage in Boxers*. London. Pitman Medical and Scientific Publishing Co.This quote also appeared in an article published a year later on concussions and horse jockeys. The authors of this report were less adamant than other authors that it was obvious that concussive blows might lead to traumatic encephalopathy in sports other than boxing. The authors provided five cases in jockeys that they believed warranted suspicion. Their article concluded: "Our recent experience indicates that National Hunt Jockeys are exposed to frequent and often severe unrecorded concussive head injury, and that this can result in brain damage and temporal lobe-epilepsy and the other features recognized as post-traumatic encephalopathy. There appears to be inadequate supervision and restriction of head-injured jockeys, and the possibilities of permanent disability and suspension early in their career are not matched by adequate provisions for compensation. To quote Roberts: "doctors have a duty to convince the controlling bodies and participants in sports where concussion is frequent that the effects are cumulative and that the acceptance of concussion injury, though gallant, may be very dangerous". *See* Foster, J.B. *et al*. 1976., "Brain Damage in National Hunt Jockeys." *The Lancet* 307. 7967, pp. 981-83.
[249] -- 1976. "Brain Damage in Sport." *The Lancet* 307. 7959., p. 401.

> seen none professionally." Another neurologist remarked that "Rugger seems to have become a depraved and brutal sport even in schools; the players punch each other freely and of course with bare fists so they may well damage each others brains as much as boxers do. I have, however, seen no cases." Professional wrestling was twice incriminated but without details. One parachute jumper was mentioned who had been credited with 550 jumps. The sport most often mentioned, other than boxing, was horse-riding. About a dozen jockeys were believed to have developed a traumatic encephalopathy; all had been steeplechasers. A few comments may be quoted: "I have seen some incredibly damaged professional steeplechasers with a history of uncountable concussions and not one very serious head injury. One is a dependent wreck with no recent memory". A medical report on another stated "this young man is beginning to show an early punch-drunk syndrome and this can almost certainly be attributed to his multiple head injuries."[250]

172. By 1980 these trends appear to have solidified into a consistent view of concussions in contact sports. That year, physicians at the Institute of Neurological Sciences in Glasgow engaged in a retrospective study of serious head injuries, advised avoidance of cumulative damage from concussions in sports:

> Injuries producing even a few minutes' post-traumatic amnesia may cause some microscopic structural brain damage and impaired psychological function for two to three weeks. The effects of repeated minor injury are cumulative; the occurrence of permanent damage (traumatic encephalopathy) in boxing and in jockeys has led to the introduction of statutory medical cover in these sports. More recently, it has been suggested that a similar encephalopathy may occur in other sports, including Association football, rugby football, and wrestling. Boxers must wait four weeks after loss of consciousness before fighting again to allow recovery from the injury. Similar rules should probably be applied to all sports, although a short period of post-traumatic amnesia (as distinct from loss of consciousness) should not necessarily prevent a player from returning to a non-combative sport. If the postconcussional syndrome is present – namely persistent headaches, postural dizziness, irritability, and a failure of concentration – the player should not return to the sport until all symptoms have resolved. It is understandable that both trainers and players may be reluctant to follow such policies, but if further damage should occur before recovery is complete then cumulative effects may be more serious. Thorndike suggested that any player who has sustained three or more injuries with loss of consciousness of post-traumatic amnesia should be banned from further contact sports. Murphey and Simmons advised that if head injury was severe enough to produce coma, or if a player has had a craniotomy, then further contact sports should be discouraged.[251]

173. To summarize, from 1970 to 1981 yet further research was published on brain injuries and in sports medicine that indicated that protracted even permanent symptoms as well as neurodegenerative diseases could follow repeated brain injuries. The result of these findings was that researchers in sports medicine offered a great deal of precautionary guidance that could have substantially altered the NCAA's approach to student safety.

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[250] -- 1976. "Brain Damage in Sport." *The Lancet* 307. 7959., p. 402.
[251] Lindsay, K. W. *et al*. 1980. "Serious Head Injury in Sport." *British Medical Journal.* 281. 6243, (1980), pp. 789-91.

C. The NCAA's CSMAS Actions on Brain Injury and Disease, 1970-1981

174. Between 1970 and 1981 the CSMAS was able to achieve little in advancing the safety of students participating in college football and other contact sports. The NCAA's lack of action stands in stark contrast to the extensive history of research on the dangers of single and repeated concussions. The literature stretched back a whole century. By the 1970s neurosurgeons, pathologists, sports medicine researchers, and experts in biomechanics had contributed findings that showed that single and repeat concussions were dangerous injuries that brought with them the potential for long-term latent brain disease. Epidemiologists in that period estimated that individuals who suffered one concussion were at substantially greater risk for a second. Other researchers warned that concussions were cumulative injuries and stated that doctors had a duty to convince sporting authorities of this fact.

175. Throughout the 1970s the CSMAS appeared to be oblivious to the broader medical and intellectual climate in which their own work occurred. The CSMAS was unable or unwilling to effect change within the NCAA. The committee sought slight rule changes, modifications to mandatory equipment, and funds to support a bare-bones budget for research. Most changes it proposed were not designed to warn students of the risks they faced in athletics, particularly football. Even the weak changes the CSMAS proposed were slow to occur, because the NCAA's layers of bureaucracy, committees, and tendency to second guess sometimes prevented commonsense medical action.

176. What follows is a timeline derived from the CSMAS committee minutes that illustrate these patterns. The timeline culminates in the revision of the NCAA Sports Medicine Handbook in 1981, which included no information about concussions at all.

April 1970	The Executive Committee voted for the NCAA to join National Operating Committee for Standards on Athletic Equipment (NOCSAE).[252]
June 1970	Annual report indicated that the CSMAS passed a resolution "strongly condemning the practice of coaching football players to "put the head on the numbers" or to use the head as a battering ram. This technique of butt blocking or spear tackling has got to be recognized for the dangerous technique it is."[253]
Aug. 1970	Donald L. Cooper, Chair of CSMAS, described the NCAA's lack of a "mandatory mouth protector rule" as "evidence of gross negligence on its part."[254]

[252] NCAA Executive Committee Minutes, April 24-25, 1970, p. 16.
[253] NCAA CSMAS *Annual Report of NCAA CSMAS 1970,* p. 1.
[254] NCAA CSMAS Letter from Donald L. Cooper to John Waldorf, 5 August 1970.

Aug. 1970 The Executive Committee has approximately $140,000 in excess receipts, but gives only $5000.00 to the CSMAS while giving, for example, its legal fund $30,000.00.[255]

Dec. 1971 Donald L. Cooper, Chair of CSMAS, again described the NCAA's lack of a "mandatory mouthpiece rule" as a "very deplorable position."[256]

Jan. 1972 CSMAS recommended that the hard outer surface of football equipment be covered with a soft impact-reducing substance to help lower the number of injuries; also recommended mandatory mouthpieces; and rule changes on "butt blocking" and "stick tackling" and timeout rules for injuries.[257]

Jan. 1972 CSMAS requested additional funds for research. "I think the minimum per year would be $20,000.00. At one time, we were being allotted $25,000.00 and this was probably about right."[258]

June 1972 Walter Byers noted that the CSMAS was running a deficit and does nothing to help.[259]

July 1972 The proposed budget for the CSMAS for 1973 is $12,000.00.[260] At the same meeting, Carl Blyth notes "head and neck injuries showed an increase" and stated "that he would recommend that if a boy has had a concussion *of any degree*, he should not play for a month, and if serious, for at least one year."[261]

1973 mouthguards become mandatory (first noted in 1958)

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[255] NCAA Executive Committee Minutes, August 17-18, 1970, p. 13.
[256] NCAA CSMAS Letter from Donald L. Cooper to Walter Byers, 22 December 1971.
[257] NCAA CSMAS Minutes of the CSMAS, 5 January 1972, pp. 1-2.
[258] NCAA CSMAS Memo from Donald L. Cooper to Walter Byers , 21 January 1972; request was sent again. See NCAA Letter from Donald L. Cooper to Walter Byers, 21 February 1972.
[259] NCAA CSMAS Letter from Walter Byers to Carl S. Blyth, 27 June 1972.
[260] NCAA CSMAS Minutes of the CSMAS, July 17, 18, 1972, p. 4
[261] NCAA CSMAS Minutes of the CSMAS, July 17, 18, 1972, p. 7. The Annual report for 1972-73 stated "due to lack of finances available for research grants, the committee deferred action on the following research proposals: "Evaluating the Effects of Outside Padding on the Hard Shell Football Helmet., Richard Schneider." *Annual Report CSMAS, 1972-73*, p. 1. There was substantial discussion of outside padding. Donald Cooper had written to Cliff Speagle Chairman of the FRC in November 26, 1973 describing people who had written to him on the matter, including A. C. Larcher a Chiropractic Physician in Chicago. Larcher had written David Nelson on 4 April 1972 and Donald Cooper had responded on April 13, 1972. The matter had arisen again on May 28, 1974 which Larcher wrote to Cooper again and included a memo dated 26 December 1973 entitled: "Football Helmet Injuries" when Larcher wrote "not one known type of helmet is capable of effectively absorbing, dissipating, or dispensing the impact force prior to its reaching the conventional hard exterior shell of the helmet. In most instances, the force of impact could result in serious head injuries." Larcher also wrote that (see p. 6): "the presently developed helmets being used by football players does not in any manner provide a dispersing of the impact energy created by football impacts, nor does it absorb, dissipate, disperse these forces for the recipient of the hitter himself prior to its reaching the conventional hard exterior shell of the helmet." The matter remained still unexplored by NOCSAE in 1976 when Minutes of the Joint Commission on Competitive Safeguards of Sports recommended that "NOCSAE make a study regarding the covering of the outer shell of helmets with suitable padding to determine if head and neck injuries can be reduced," see p. 2. Donald Cooper said in the New York Times, 19 October 1975 that helmets were "the damnest meanest tool on the face of the earth" and admitted "everyone wants to play Cornell" because they had padding on the outside of the hard-shell helmet. See Gordon White, "Helmets Blamed for More Injuries."

July 1973 Approved a motion to urge the Football Rules Committee to "seriously consider legislation that prohibits blocking below the waist on free kicks and scrimmage kicks. The Committee also requests information from the Football Rules Committee as to what disposition was made of their previous similar recommendation."[262]

July 1973 CSMAS passed a resolution that states:

> Calculated risks as well as benefits are inherited by collegiate institutions sponsoring athletic activities. To physicians and athletic trainers are delegated the responsibility to represent the sponsoring institution's interest in controlling the risks. The task of determining an athlete's medical eligibility for participation, when given to team physicians and/or qualified athletic trainers, provides the coach, and the athlete [an] informed estimate of the significance of an injury or other atypical condition. Further, it provides responsible medical supervision for visiting teams and tourney contests hosted by the institution. The NCAA [CSMAS] urges all collegiate institutions to strive for quality medical supervision of their athletic programs to support the decision making prerogatives delegated to these personnel.[263]

Aug. 1973 Estimate excess receipts are found to be approximately $132,000. Allocations are given to various funds. The legal reserve, for example, receives $60,000.00. The CSMAS receives $0.00, despite the fact that its budget in that year was a mere $12,000.00.[264]

July 1974 CSMAS learned that Football Rules Committee has changed the downfield blocking rule and "worked diligently on a spearing clarification statement."

Jan. 1975 CSMAS recommended that NCAA championship handbooks require that a physician or certified athletic trainer be "readily available" and "be made known to the participating coaches." At the same meeting, complaints are expressed about the "derogatory treatment of the football injury problem by the ABC-TV Special, "Paying the Price."[265]

1976 ***Football Code finally states that helmets can be dangerous weapons (first noted in 1959)***[266]

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[262] NCAA CSMAS Minutes of the CSMAS, July 16, 17, 1973, p. 2.
[263] NCAA CSMAS Minutes, July 16, 17, 1973, p. 3. The chairman was charged to expedite publication before 1973.
[264] NCAA Executive Committee Minutes, August 21, 1973, p. 21.
[265] NCAA CSMAS Action Items 5 January 1975, p. 3. The Nelson Papers make clear that the Football Rules Committee was in close and direct communication sometimes with powerful media interests. One 1974 letter from David Nelson to Chuck Howard, Vice President of ABC Sports, makes clear that the committee sought to shape the language of announcers and analysists about playing rules, and he commented "The committee feels very strongly that college football, in contrast to other sports, has adapted to the times and ingenuity of the coaches by adjusting with major changes in the rules…." Letter from Nelson to Howard, 28 February 1974, David Nelson Papers, pp. 1-2, p.1.
[266] For background, see Charles S. Frazier, "Get the "Head" Out of Football" MSS 328, Box 4, F69, David Nelson Papers, pp. 1-19, pp. 7-8 particularly.

Jan. 1977	NCAA CSMAS recommended "The presence of a personal qualified and delegated to render emergency care to a stricken athlete, preferably a certified and/or licensed athletic trainer" as well as planned access to a physician and medical facility.[267]
1978	***It becomes mandatory that NCAA athletes use NOCSAE-certified helmets (NOCSAE has existed since 1970)***
April 1978	CSMAS proposed an in-house National Athletic Injury/Illness Reporting System.[268]
Aug. 1978	CSMAS issued the statement of shared responsibility that indicates that "athletes rightfully assume that those who are responsible for the conduct of sports have taken reasonable precautions to minimize the risk of significant injury."[269]
June 1979	CSMAS learned that the NCAA Executive Council rejected the proposal for an in-house National Athletic Injury/Illness Reporting System.[270]
June 1979	CSMAS affirmed the right of physicians at universities to decide whether an impaired athlete many continue to participate in sport and states that medical disqualification can only occur when an atypical condition presents "unusual risk of further damage or disability to the individual".[271]
Jan. 1980	The CSMAS proposes to publish on an annual basis "a sports medicine handbook."[272]
Feb. 1980	The CSMAS adopts the NOCSAE warning label that helmets cannot protect the wearer from severe head or neck injuries.[273]
July 1981	CSMAS learned again that the Executive Committee rejected the creation of an in-house Athletic Injury Survey. Members of the Executive Committee indicate that member institutions should conduct such studies and members of the CSMAS that doing so would be much more costly.

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[267] NCAA CSMAS Memo from Dennis Poppe to Tom Jernstedt, 19 January 1977.
[268] NCAA CSMAS Memo from Dennis Poppe to Tom Hansen, 5 April 1978; it is of interest to note that Walter Byers was reminded of the existence of Dr Edward Nichols attempts to study football injuries in 1904 in October of 1978. A letter found in the David Nelson Papers makes clear Byers heard from Nelson that "Football is dangerous with a high-injury risk but is relatively safe and the "sue someone" syndrome is not going away or be reduced by a safety film…. I would hate the NCAA be associated financially and otherwise with a film over which it has no control of the finished product. Finally, the federation and the NCAA would be acknowledging our game has the same safety problems as the NFL." David M. Nelson to Walter Byers, 30 October 1978. Nelson was describing a proposal entitled "The Athletic Institute Football Safety Proposal" which said "As early as 1904 Dr. Edward Nichols attempted the first analysis of football injuries," p. 1.
[269] -- 1978 "Shared Responsibility for Sport Safety: A Statement of the NCAA Committee on Competitive Safeguards and Medical Aspects of Sports", p. 1; a published version of this appeared in Clark, K. S. 1980. "Shared Responsibility for Sport Safety: A Statement of the NCAA Committee on Competitive Safeguards and Medical Aspects of Sports." *The Journal of the Arkansas Medical Society* 76. 10., pp. 381-382.
[270] NCAA CSMAS Minutes of the CSMAS, June 11-12, 1979, p. 1.
[271] NCAA CSMAS Minutes of the CSMAS, June 11-12, 1979, p. 1.
[272] NCAA CSMAS Minutes of the CSMAS, January 4-5, 1980, p. 1-2.
[273] NCAA CSMAS Memo from Dennis L. Poppe to CSMAS Members, 1 February 1980.

July 1981 Second edition of the NCAA Sports Medicine Handbook appears. There is no mention of concussion, except on a health questionnaire to be filled out by the student where it asks: "Have you had a major injury (including cerebral concussion) since the above exam?" Nothing on the questionnaire or in the handbook explains what a concussion can be, what the consequences of concussion might be, and what advice doctors might have for the student with multiple concussions (multiple major injuries).[274]

177. Thus, to summarize, in the period from 1970 to 1981, the CSMAS struggled to make minor safety equipment mandatory and to convince the NCAA to make modest rule changes on spearing and butt-blocking, which had been called for since the early 1960s. At long last mouthguards did become mandatory, the Football Rules Committee did eventually clarify the language on spearing, and additionally a performance standard for helmets emerged and was taken up by the NCAA. CSMAS's efforts to gather additional information or fund additional research were blocked by inertia, bureaucratic sluggishness, and choices at the top that made it hard for the body to execute its basic mission. Funding was cut or in short supply, and proposals for new initiatives like the Athletic Injury Survey that would have helped the CSMAS were blocked. These facts came in for incisive criticism in an essay about football at all levels, but possessing many sharply worded sentences for the NCAA and college athletics in particular, that appeared in *Sports Illustrated* in 1978.[275] Journalists at the time had attempted to warn college authorities that they were simply not doing enough.

178. What's more, absent from these actions and publications through this period was any recognition of the extensive literature on concussions or new policy and guidelines that addressed that literature. This lackluster attitude was not for a lack of knowledge. Carl Blyth in 1972 had drawn the committee's attention to the fact that injuries to the head were increasing and recommended "that if a boy has had a concussion *of any degree*, he should not play for a month, and if serious, for at least one year."[276] The NCAA's own health questionnaire that appeared in its 1981 Sports Medicine Handbook also listed cerebral concussions as a major injury to be reported. Despite this, the handbook gave no information about concussions, had no guidelines on them, and provided no education about their risks to students participating in any sport, including the most dangerous one: football. As seen from the timeline drawn from the CSMAS minutes, the committee made no effort to convince the Executive Committee to adopt even a modest concussion grading system, or a return to activity protocol following a concussion, or to the

[274]NCAA, 1981. *NCAA Sports Medicine Handbook*, Kansas. p. 14.
[275] Underwood, John. 1978. "An Unfolding Tragedy. As Football Injuries Mount, Lawsuits Increase and Insurance Rates Soar. The Game Is Headed Toward a Crisis, One that is Epitomized by the Helmet, which is Both a Barbarous Weapon and Inadequate Protection." https://www.si.com/vault/1978/08/14/822885/an-unfolding-tragedy-as-football-injuries-mount-lawsuits-increase-and-insurance-rates-soar-the-game-is-headed-toward-a-crisis-one-that-is-epitomized-by-the-helmet-which-is-both-a-barbarous-weapon-and-inadequate-protection. Accessed June 26, 2019.
[276] NCAA CSMAS Minutes of the CSMAS, July 17, 18, 1972, p. 7.

medical history within the NCAA itself that concussions in football were known to be cumulative injuries that led to latent brain disease. These were all subjects with extensive medical literature the NCAA knew well. The NCAA could have addressed them but did not.

D. NOCSAE, Brain Injury and the NCAA, 1970-1981

179. As noted in the timeline above, in April of 1970 the Executive Committee of the NCAA voted to "commit the Association to membership" in the National Operating Committee on Standards for Athletic Equipment in response to emerging federal legislation. NOCSAE's charge was to develop safety standards for football helmets in accordance with the policies of the National Commission on Product Safety. The NCAA joined an organization in which other members included the Athletic Goods Manufacturers Association, Rawlings Sporting Goods, Riddell Sporting Goods, National Junior College Athletic Association, National High School Federation, National Athletic Trainers Association, and the American College Health Association.[277] It should be clarified that very little in the NCAA's history prior to this moment and then afterwards shows the organization's highest leadership to have been so responsive to medical trends as it was in this moment (although its response to the COVID19 Pandemic that began in the late Winter of 2020 has had a close resemblance to this historic moment). The speed at which the NCAA responded to new federal legislation highlights further that the organization was able to take executive action when it faced external pressure and the risk of liability and litigation. A response that made the often decades of time taken to make even minor safety changes that much more indicative of a lack of concern and commitment to its own stated goals of safety and care of students participating in athletics.

180. From the beginning of NOCSAE's existence in 1970 it was clear that all parties involved (sports associations, manufacturing industries and distributors, and school and college associations) were concerned by the specter of lawsuits. One delegate to the committee's inaugural meeting observed that the "future of athletics is in jeopardy because of potential lawsuits relating to injuries received in sports."[278] The NCAA had immediately sought to "obtain the advice of legal counsel as to the Association's liability if it becomes involved in approving athletic equipment."[279] A delegate at the 1970 Joint Commission on Competitive Safeguards and Medical Aspects of Sports had warned "there is a real danger of statements" and that "the Commission should be careful of recommendations made in writing and circulated around the

[277] NCAA Executive Committee Minutes, April 24-25, 1970, p. 16. Although listed in the executive committee minutes, the American Medical Association appears not to have become involved. See Minutes of the Joint Commission on Competitive Safeguards and Medical Aspects of Sports, June 10, 1970, p. 3. For Riddell and Rawlings see NOCSAE Minutes, April 28-29, 1970, p. 1.
[278] NOCSAE Committee Minutes, April 28-29, 1970, p. 2.
[279] NCAA Executive Committee Minutes, April 24-25, 1970, p. 16.

country because of the incidence of law suits."[280] The NCAA Newsletter echoed these sentiments shortly after.[281]

181. Beyond these points, however, it should be clear that the NCAA's leadership may well have sensed a threat to its autonomy in the movement and legislation towards consumer product safety. Having worked hard to monopolize collegiate-level amateur athletics in the United States, the emergence of standards for football equipment could have resulted in a loss of professional control. As historian Kathleen Bachynski has described the NCAA's involvement was "intended to ensure that they could retain control over sports standards, rules, and regulations."[282] The introduction of standards for helmets might well have paved the way towards debates outside of the NCAA about engineering performance standards and rules of play. Debates among all stakeholders might well have raised potentially embarrassing questions (and indeed did subtly at a Conference on Football Injuries hosted by the American Society for Testing and Materials in 1968)[283] about the persistence of spearing, butt-blocking, crack-back blocking, the use of helmets as weapons, the lack of a mandatory mouthguard policy, recurrent concussions, groggy states, and, of course, persisting fatalities within the NCAA. To do nothing would have been impossible in the emerging legislative climate of the Nixon years. But to allow others to do the work of standardization would have been to risk the erosion of their control over the lucrative college sport.

182. Some background is important. By the 1960s, as historian Bachynski described, "longstanding criticisms about the lack of data on football helmet safety or equipment standards had become complementary to broader calls for government health and safety research and regulation."[284] The American Standards Association (hereafter ASA) had created a committee – called Z-90 – which had been chaired by

[280] Minutes of the Joint Commission on Competitive Safeguards and Medical Aspects of Sports, June 10, 1970, p. 3.
[281] -- 1970. *NCAA News: The National Collegiate Athletic Association.* June, p. 5. The passage stated: "Beside the desire for greater safety in competitive athletics, an important reason for the formation of the Committee is the number of lawsuits being contested today based on charges of substandard equipment. According to Dr William Combs, a Committee member representing ACHA, "the future of athletics is in jeopardy because of potential lawsuits relating to injuries received in sports." The authors says that NOCSAE will investigate football helmets. "It is the Committee's intention to establish minimum equipment standards as part of the rules of each sport by making recommendations which the rules-making bodes of the various governing organizations might then incorporate into the playing rules." p. 5.
[282] Bachynski, Kathleen. 2019. *No Game for Boys to Play: A History of Youth Tackle Football and the Origins of a Public Health Crisis.* Chapel Hill, NC: University of North Carolina Press.
[283] Report of the Conference on Football Injuries American Society for Testing and Materials, 18-19 November 1968, David M Nelson Papers, pp. 1-6. At one moment according the proceedings, "Doctor J. O. Outwater, University of Vermont, reminded the group that improved equipment is not the only method of reducing injuries; rule changes might also be helpful (p. 2)." The document also captures an important subtext shaping the subsequent creation of NOCSAE. It was mentioned in the proceedings that, "Coaches are heavily dependent on the equipment manufacturers to maintain quality and improve safety (p. 3)."
[284] Bachynski, K.E. 2016. *No Game for Boys to Play: Debating the Safety of Youth Football, 1945-2015*, PhD dissertation Columbia University, p. 158.

a clinician, George Snively, and had developed a standard for headgear for vehicular users in 1966. Backynski explained:

> In November of 1967, the ASA's Z-90 committee first considered broadening its scope to include the development of standards for helmets used in sports, beginning with football. At the 1969 [National Commission on Product Safety] hearings, Dr. Snively noted that the Z-90 committee was in the midst of revising a draft for its first football helmet standard. Yet he testified that all "voluntary standards" suffered from a lack of enforcement…Dr Snively concluded that external quality control enforced by an agency or other source independent of helmet manufacturers appeared to be necessary to ensure satisfactory product quality.[285]

183. Here again that longstanding pattern of the NCAA is clear: While individuals removed from the world of sports were recognizing that no safety standard existed for governing football equipment standards by 1967, the NCAA had been confining its attention to whether malicious and unsportsmanlike activities were responsible for head and neck injuries.[286] Critics of helmets, however, were asking far more advanced questions pertinent to college student safety. In 1969, for instance, Detroit attorney Henry Philo criticized the emerging Z-90 standard as a consensus standard and explained that a competent attorney asking "How could due care on the part of some collectible person have prevented injury to my client?" would have concluded that helmets (or any product) were defective because they lacked "warnings of limitations reasonably necessary for safe use." Worrying about "bizarre personality changes caused by microscopic brain damage from subfatal acceleration injuries, Philo wrote: "The helmet manufacturers fail today to warn the user that he may be severely brain damaged or killed since the helmet does not protect against reasonably foreseeable blows."[287]

184. The NCAA had learned of the existence of the Z-90 committee's standard and its movement into the world of sports equipment. Minutes from the Joint Commission on Competitive Safeguards and Medical Aspects of Sports to which the NCAA sent delegates provide some context about the American Standards Association's helmet standard:[288] "It was reported that the Z-90 was formed to establish standards for protective head equipment and had in effect printed a standard. Z-90 wanted to attach a label to each head gear. This would be a one crash affair."[289] The standard was described as inadequate

[285] Bachynski, K.E. 2016. *No Game for Boys to Play: Debating the Safety of Youth Football, 1945-2015*, PhD dissertation Columbia University., p. 159.
[286] In retrospect Carl Blyth described to S. John Byington, Chairman of the Consumer Product Safety Commission, that: "At its inception, the immediate concern of NOCSAE was the establishment of a safety standard for football helmets since none was in existence." NCAA Letter from Carl S. Blyth to S. John Byington, 1 August 1977.
[287] Henry M. Philo, "Second Down for Football Safety" *Trial Magazine* August/September 1969, p. 36.
[288] Bachynski, K.E. 2016. *No Game for Boys to Play: Debating the Safety of Youth Football, 1945-2015*, PhD dissertation Columbia University. p. 159.
[289] NCAA Minutes of the Joint Commission on Competitive Safeguards and Medical Aspects of Sports, June 10, 1970, p. 2.

by the Joint Commission, precisely because it did not include repetitive criteria for hits.[290] Despite the absence of any replacement standard, no one at the NCAA appears to have asked and answer the question *"why are we so sure the Z-90 standard is wrong?*" In other words, the NCAA appeared unaware both of the legal criticism writers like Philo had lodged against it as a consensus standard and the broader engineering challenges involved in creating a standard for a helmet hit thousands of times at variable rates of acceleration.

185. Whatever the case, the CSMAS committee continued to describe the Z-90 standard as inadequate and in July 1970 the committee first heard details about NOCSAE. "It was brought to the attention of the committee that an article had been published in Sporting News reporting the verdict of the two million dollar lawsuit in California against the Rawlings Sports Goods Company. It was considered a land mark verdict and the article was read to the committee by the Chairman."[291] Joining NOCSAE meant that the NCAA would partner with Rawlings, Wilson, MacGregor, Spalding, Riddell, and other equipment manufacturers. The concern that this might have raised about conflicts of interest went ignored.[292]

186. NOCSAE was not alone in this period in analyzing football helmet standards. In addition to the ASA, the American Society for Testing and Materials (hereafter ASTM) was also exploring the issue. NOCSAE and ASTM appear to have had a somewhat friendly but also cool relationship.[293] Both organizations sought standards across the 1970s; both organizations conducted research.[294] But because NOCSAE represented the equipment manufacturers, and was supported in its endeavors by the NCAA (a large purchaser of safety equipment), its approach to standards ultimately prevailed. It was helped, moreover, by the fact that it appears that the NCAA made special efforts to lobby the Consumer Product Safety Commission on behalf of NOCSAE in November of 1973.[295] As described in the above timeline about CSMAS activities in the 1970s, all of NOCSAE's work culminated in the NCAA mandatory requirement that all helmets pass NOCSAE certification[296] and have after 1980 the NOCSAE warning label (note that it took 10 years for college students playing NCAA football to receive even this modest statement of limitations) which focused on acute dangers and left chronic ones ignored.[297]

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[290] NCAA Minutes of the Joint Commission on Competitive Safeguards and Medical Aspects of Sports, June 10, 1970, p. 6.
[291] NCAA CSMAS Minutes, 20 July 1970, p. 3.
[292] NCAA CSMAS Minutes, 20 July 1970, p. 3.
[293] See, for example, NCAA CSMAS Minutes July 17, 18, 1972, p.4 and here the CSMAS appears somewhat worried about ASTM's competition; also see NOCSAE Minutes, 27 January 1975, p. 2.
[294] Bachynski, K.E. 2016. *No Game for Boys to Play: Debating the Safety of Youth Football, 1945-2015*, PhD dissertation Columbia University., p. 159-160.
[295] NOCSAE Minutes January 28, 1974, p. 3.
[296] NCAA CSMAS Memo from Dennis Poppe to Tom Hansen, 5 April 1978, p. 5
[297] NCAA CSMAS Memo from Dennis L. Poppe to CSMAS Members, 1 February 1980.

187. Several elements of NCAA relationship with NOCSAE should be contemplated. Despite the fact that the creation of NOCSAE had been the result of the well-known fact that no recognized standards existed for football helmets in 1970, the NCAA:

- Never warned students participating in athletics that their helmets had no recognized standards
- Never warned universities that students participating in NCAA football used helmets with no recognized standards
- Pronounced inadequate an existing standard for helmets used in vehicular collisions without any alternative to hand
- Played a partisan role in selecting among three prospective standards makers – NOCSAE, ASTM, and ASA
- Ignored that by picking winners and losers in helmets standards, they were minimizing competition and perhaps limiting progress on standards protecting university students
- Ignored that their involvement in helmet standards represented a significant conflict of interest, because it placed them in the role of being both a consumer and via their members also a distributor (after all only the NCAA could mandate by 1978 the use of NOCSAE approved helmets)

188. It is this last point that really clarifies the role the NCAA had assumed for itself. The NCAA had learned that manufacturers were being faced with liability resulting in large lawsuits. Under the Consumer Product Safety Act distributors were "subject to most of the requirements applicable to manufacturers."[298] Under the new legal regime, consumer protection meant that those manufacturers and distributors had to produce the safest equipment possible. But who was the consumer for helmets? In the case of the NCAA, the organization had worked aggressively over the years to clarify that the student participating in intercollegiate sports was an amateur – a so-called "student-athlete." Given the student's status, the student could not be expected to procure his equipment or be called a consumer. Thus, the NCAA had to be the consumer. But because the NCAA also had to supply students with the helmet, it in effect occupied a dual role as a distributor of goods and a consumer.

189. It appears that under the Consumer Protection Act of 1972 representatives of consumers had the right, if technically qualified, to take over primary responsibility for the development of a rule, presumably to "protect against unreasonable hazards" associated with consumer products.[299] Thus, by joining NOCSAE, a performance standard setting body, over others, the NCAA was indicating its authority

[298] The Bureau of National Affairs, Inc. 1973. The Consumer Product Safety Act: Text, Analysis, Legislative History. Washington D.C. The Bureau of National Affairs, p. 9.

[299] "The ultimate beneficiary of the programs instituted under the Consumer Product Safety Act is, of course, the United States consumer. It is he whom the Act is designed to protect against unreasonable hazards associated with consumer products." And then in a description of "avenues of participation open to the consumer or his representatives include: the right to participate in the formulation of a product safety standard or other rule, at the initial stage when a proposed rule is being developed, during the actual formulation of the proposed rule, at hearings on the proposal, and even, if technically qualified, taking over the primary responsibility for the development of the rule." The Bureau of National Affairs, Inc. 1973. The Consumer Product Safety Act: Text, Analysis, Legislative History. Washington D.C. The Bureau of National Affairs, p. 12.

and technical qualification to act on behalf of its membership – to accept responsibility as a distributor for the safety of its members' students. By joining with helmet manufacturers and by entering into the process of standardization, the NCAA leadership were also saying that they were technically qualified as consumers to decide what safety meant for their users.[300] Their users – students – had no choice but to accept and believe that the NCAA was right that it possessed such technical expertise.[301]

190. After 1969, then, the conversation about performance standards and consumer protections for athletic equipment forced the NCAA to make a choice amongst options, all of which brought potential threats. If it did nothing at all, then it would have had to warn all universities and all athletes that students played with helmets no one could pronounce uniformly effective, thereby making universities and the NCAA liable in all head injury disputes. If it had not joined NOCSAE, then it might have had to accept a consensus process that would have undoubtedly emerged among the organizations seeking to create standards (NOCSAE, ASA, and ASTM). That consensus process could have found that a complete reform of football was necessary in order to make a consumer product that could handle the requirements of the sport at an elite, amateur level. Such a finding would have dramatically undercut the independence of the NCAA and perhaps killed the popularity of football, its golden goose. If it picked a winner among the various standards makers, then the NCAA would have to accept liability for the standard that emerged. Directly due to their decision to join NOCSAE, and due to the fact it distributed through its members' institutions helmets to users it mandated that they use, the NCAA took on the responsibility of insuring that the standards were the best possible and reflected existing scientific, medical and engineering literature on head and brain injuries.

191. It is curious that the NCAA's leadership appears not to have apprehended that by joining a standards organization, it would be effectively aiding the advertising opportunities of its partners. Nor does it seem that the NCAA leadership or the CSMAS or even NOCSAE recognized the inherent possibilities of other complicating conflicts of interest that emerged in the wake of this new relationship. Riddell Sporting Goods provides a case in point. In 1973 Charles R. Logan, Director of Marketing and Advertising at Riddell sent a letter to Riddell distributors:

> Dear Riddell Dealer: Hell! You knew it! We knew it! The Pros knew it! THE RESULTS OF THE 1st INDEPENDENT TEST CONDUCTED AT WAYNE STATE UNIVERSITY CONFIRM THAT RIDDELL RANKS NO. 1 IN PROTECTION WHEN

[300] Here we should note that this very matter of shaping equipment makers production standards had been raised by a National Football League study described in the *Medical World News* in November 1976. "The NFL-sponsered study concluded that the league should exert "consumer preference" pressure on equipment makers, starting with the immediate request of prototypes of soft shoulder pads…. It recommended that the NFL try out soft helmets in practice sessions to help gain acceptance of them." See: "A little-known NFL study indicts helmets and shoulder pads as weapons" *Medical World News* 15 November 1976, p. 23-24.

[301] It is striking to me that the manufacturers and distributors didn't appear to ask whether the NCAA could be deemed a consumer representative.

> TESTED HEAD TO HEAD WITH 8 LEADING COMPETITIVE HELMETS! Now we are going to make sure that everybody knows it! Then we are announcing the news in full page ads in Scholastic Coach and Athletic Journal. And just to make sure we are sending the attached letter and ad pre-print to 22,000 coaches. Remember, this isn't just another helmet test. Just look at the ad and see who the sponsors are – like the NCAA and the National Federation of State High School Associations. If there is any way we can help you spread the word to the coaches in your area just get in touch with me. Let's make sure everyone knows the score.[302]

192. Such conflicts were not the only issue implied by joining NOCSAE. Another was that by picking an organization to join the NCAA had in effect encumbered itself with the burden of trusting that its partners' interests were its interests. In fact, of course, the NCAA was supposed to have only student health and safety as a priority. By joining NOCSAE, the NCAA was assuming both the risk of understanding the clinical and technical challenges and also determining that one organization among the options in the marketplace understood those risks better than its competitors.

193. A newspaper article published in 1971 proves tragically illustrative of the consequences of picking among standards' producers. The article describes the work of Creighton J. Hale, Chairman of the American Society for Testing and Materials technical committee (NOCSAE's competitor) towards producing a safe football helmet. "Basically, it's very simple to set standards for safety equipment," Hale said in his interview. "The head is most critical in football," he continued. "The brain is situated very loosely inside the skull and has a tendency to move about. It is this moving about that really causes the damage, rupturing the blood vessels. Some data claim that professional football players get punchy from too many blows to the head." He added, "but there is no factual evidence to prove that claim now." [303] Unlike the ASTM, so far as I have found, NOCSAE was unaware of the vast body of scientific and medical literature on the dangers and hazards of concussions. By 1970 the NCAA also appeared unaware that in their very own 1933 medical handbook and in their very or 1944 Boxing Guide and Official Rules they had warned their own doctors and members of that precise possibility. As this report has shown, nothing had changed by 1981 that made that transparent warning any less salient or appropriate.

194. Records, however, indicate that after 1972 any effort to change had been advised against by lawyers. In December of 1972, David M. Nelson received a letter from William Geoghan of the law firm Speiser, Shumate, Geoghan, and Krause. Geoghan had represented a Colgate student named Steven Mark who had been hurt playing football. Walter Byers had advised Geoghan to contact Nelson, and he requested permission from Nelson to address the Rule Committee of the NCAA.[304] That permission was not forthcoming. By March 13, 1973, Nelson had received another letter, this time by Wilson, Bave &

[302] NCAA Letter from Charles R. Logan to Riddell Dealer, March 19, 1973.
[303] Shenfeld, Gary. 1971. "Doctors Plan Defense to Stop Injuries." *The Herald*, September 3: 8.
[304] Letter from William F. X. Geoghan to David M Nelson, 27 December 1972. David Nelson Papers.

Hayes Attorneys at Law. The letter began: "It is my understand that you are the recipient of a letter from Gordon Marshall, a New York attorney, with reference to suggested change in rules as advocated by Messrs Marshall and Geoghan."[305] The letter then warned that "Mr Geoghan is well known throughout the country as a plaintiff's advocate, specializing in all sorts of negligence cases…. He is now concentrating his efforts on football and injuries incurred therefrom…. The obvious purpose of his letter and the suggested changes in the future are only to lay the groundwork for cases in futuro."[306] The author then explained sharply:

> There is a clear distinction between making initial contact with the frontal lobe of the helmet and then driving the main force of the tackle after encircling the ball carrier with the arms, the principal blow being delivered with the chest, and spearing. An official from the ECAC testified that the present mode of tackling now in force and now being utilized is perfectly safe in games which we all recognize as violent and is clearly distinguishable from illegal spearing. Kindly bear in mind that if any of their letters, speeches and/or reports are published in any periodicals this will form the basis of devastating cross-examination of football coaches at all levels in the future. In my opinion, in effect, any heed paid to their suggestions will destroy present day football as we know it.[307]

195. William Geoghan's advice to prevent future injuries to the head would not shape the NCAA's health and safety advice to students. Helmet to helmet and helmet to chest tackling and blocking techniques were "perfectly safe", according to NCAA lawyers. But evidence to the contrary had been clear for generations of NCAA administrators and medical advisors.

196. A 1974 letter from Coach Roger Robinson to John Waldorf excoriated the Football Rules Committee for a rule change, with Robinson asking rhetorically "how much serious thought did the committee give to the dangers of increased head and neck injuries," and reminding Waldorf of "A fact – head and neck injuries are more dangerous than knee injuries…. Players with serious head or neck injuries usually do not play football again, have extreme difficulty, and great expense throughout their lives."[308] The criticism was echoed in another way too in the NCAA News from 1974. In March, readers learned that

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[305] Letter from Donald C. Wilson (Wilson, Bave and Hayes" to David M Nelson, 13 March 1973, David M. Nelson Papers. pp. 1.

[306] Letter from Donald C. Wilson (Wilson, Bave and Hayes" to David M Nelson, 13 March 1973, David M. Nelson Papers. pp. 1.

[307] Letter from Donald C. Wilson (Wilson, Bave and Hayes" to David M Nelson, 13 March 1973, David M. Nelson Papers. pp. 2.

[308] Letter from Roger L. Robinson to John Waldorf, 30 January 1974, David Nelson Papers, pp.1-2, p. 1. Robinson was subsequently chastised by Thomas Peterson of the University of Michigan Hospital who replied 25 February 1974 that while "your letter implies that responsible people such as the Rules Committee and medical people associated in this area have not given any consideration to the things that you mentioned. This is really an unjust accusation and Mr. Waldorf, I believe, explains to you that his committee has been considering this for several years." Letter from Thomas Peterson to Roger Robinson, 25 February 1974, David M. Nelson Papers. pp. 1-2, p. 1. There is no evidence of Robinson's reply to Peterson but a subsequent letter from Robinson to Donald L. Cooper makes clear that the speed involved in kick-off and punt returns could make "head to head contact" a "very dangerous situation." Letter from Roger L. Robinson to Donald L. Cooper, 1 May 1974, David Nelson Papers, pp. 1-2, p. 1.

clinician John Duff, an orthopedic surgeon, was extremely concerned about helmets. He was quoted in the article saying: "As improved as helmets are today over what they were a few years ago, they increase the danger of injury in many cases. First of all, the solid unit of plastic is a danger to the player being hit and the padding in the helmet has given the player striking the blow a false sense of security so that he becomes more careless when he uses his head as a weapon."[309] So while NCAA lawyers told the NCAA Football Rules Committee Secretary that helmet to helmet and helmet to chest tackling and blocking were "perfectly safe",[310] NCAA documents suggested alternatives.

197. It was students, of course, who got hit with these weapons, delivered carelessly by other students. It was students the NCAA existed to protect. The David Nelson Papers show that the spearing rule was "being sadly misinterpreted and not enforced within Big Ten Football." The author complained, "My God, if the head is moving upward, is it still justifiable to inflict possible serious injury to the opponent being held or on the ground?"[311] The answer should have been no.

E. *Brain Injury and the NCAA's 1983 Edition of the Sports Medicine Handbook, 1981-1984*

198. In 1983 the NCAA released an updated, second edition of its Sports Medicine Handbook. It appeared at a time when the ramifications of concussion and repeated concussion were in the public's eye, even if that fact went supposedly unnoticed by the NCAA. In February 1983 the US Congress held a hearing on boxing safety. Among those invited was a representative from the American Medical Association, Dr Robert Patterson. While testifying before Congress Patterson was asked whether he could state unequivocally that the risks in boxing were the same as those in "any contact sport". The exchange took place between Dr Patterson and Representative Dennis Eckart, then representing Ohio's 11th congressional district:

> Rep. ECKART: I'm not a doctor, and I don't pretend to have the depth of understanding. Can you equate for me the impact of a blow to a boxer's head with the force of impact in another sport of a blow to the head with different kinds of protection?
>
> Dr. PATTERSON: I think a similar kind of injury occurs in any contact sport. Football is a good example, and we've seen some serious head injuries in football. The famous quarterback from Dallas, Roger Staubach, I think, was bothered by repeated concussion in his last two years of football. Frank Gifford was, remember, knocked cold for 24 hours and left football for a year before -- and then came back to it for a brief period before retiring. The blow is the same whether it's in boxing or in football. It's just in boxing it's small, repetitive blows but maybe spread over many years and almost daily in its occurrence. The injury involves the fact that the head is accelerated by the blow. It spins

[309] "Knee Injuries Don't 'Head' List" *NCAA News,* 15 March 1974, Vol. 11, No. 4.
[310] Letter from Donald C. Wilson (Wilson, Bave and Hayes" to David M Nelson, 13 March 1973, David M. Nelson Papers. pp. 2.
[311] Letter from Gordon Stoddard to Wayne Duke, 3 December 1975, David M. Nelson Papers, pp. 1-2, p. 1.

> or twists, and the brain inside, which is a jello-like substance, also spins and twists. And it develops shearing stresses inside the head that will shear off the nerve cells, a few each time, perhaps. And it's this cumulative effect that may lead in some people to the punch-drunk syndrome. But the injuries in all contact sports are more or less the same. Helmets help, but I suppose it's not, I'm sure, going to be the entire solution to the problem.[312]

199. Given this highly public discussion of football, it might be wondered how the NCAA's medical and executive leadership could have missed such a strong statement from the American Medical Association. But the NCAA had become more insular and specialized in the way it sought medical connections between 1981 and 1983. One of the few remaining points of connection between the NCAA and the American Medical Association had been through the Joint Commission on Competitive Safeguards and Medical Aspects of Sports. In July of 1981, the CSMAS recommended to the NCAA's Executive Committee that they discontinue their "membership with the joint commission,"[313] purportedly as "time spent meeting with this group is not productive and monies could be better spent for other NCAA Sports medicine projects."[314]

200. The NCAA, now also sequestered from general medicine, remained uninterested in brain injury research in this period, which continued to develop in ways that kept with the pattern described above. In 1981 authors of a prospective study of 538 hospital admissions with head injury found noteworthy persisting difficulties. They argued that their observations lent weight to the conclusion that the effects of concussion, however slight, might not be completely reversible.[315] In 1983 a neurosurgeon Ayub Ommaya, who had pioneered much important work on concussions in the 1960s and 1970s (described above), took that point further at a conference on car crashes. He argued that the accumulating evidence gathered from many studies fit: a) the biomechanical model of concussion, b) the connection between concussion and more severe injuries, c) the fact that neuropsychological sequelae follow concussions and in cumulative ways, d) neuropathological evidence, and e) population data.[316] It is important, then, to see that not only was Robert Patterson's testimony in the US Congress unsurprising, it was a logical extension of studies that had commenced in the 1950s and of concerns that had been raised about sports and concussions that had existed for much longer. Indeed, the arguments in the 1950s had been largely similar, but research across the next three decades had refined and justified confidence in the shear strain model of brain injury – a model which abetted NOCSAE's efforts to develop safety standards for football helmets.

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[312] American Archive of Public Broadcasting. The MacNeil/Lehrer Report; Ring Commission Hearings. http://americanarchive.org/catalog/cpb-aacip_507-g44hm5393h Accessed on 1-27-2019.
[313] NCAA CSMAS Minutes July 7-8, 1981, p. 4.
[314] NCAA Memo to Executive Committee from Fred L. Miller, 27 July 1981, p. 2.
[315] Rimel, R.W. *et al*. 1981. "Disability Caused by Minor Head Injury." *Neurosurgery.* 9. 3., pp. 221-28.
[316] Ommaya, A.K. 1984. "The Head: Kinematics and Brain Injury Mechanisms." In *The Biomechanics of Impact Trauma.* Amsterdam. Elsevier Science Publishers. p. 120.

201. In spite of the fact that NOCSAE's efforts to develop safety standards for football helmets was fundamentally premised upon the shear strain model of brain injury, the NCAA appears to have been either unaware or ignorant of many of these facts. In June of 1983 the CSMAS reviewed the history of football rules changes and agreed they should send a letter commending the Football Rules Committee "on their efforts in improving the safety of the sport" (what those efforts were in the eyes of the committee at that time is unclear). The CSMAS had noted in January 1983 that the supplies of their Sports Medicine Handbook published in 1981 had been exhausted (they were not providing members requesting copies with copies).[317] They had decided to publish a new edition but at the June meeting the CSMAS learned that, again, the Executive Committee had delayed their endeavor. The CSMAS voted:

> That the NCAA Sports Medicine Handbook, being a compilation of all the recommended sports medicine and safety policies of the Association, is a major element in fulfilling the primary charge to the NCAA Committee on Competitive Safeguards and Medical Aspects of Sports to keep the membership informed on such matters; further that the policies contained in the Sport Medicine Handbook comprise a standard against which member institutions may be compared, and as such it becomes a legal document of importance to the membership; further, that numerous changes and additions to the policies contained in the Sports Medicine Handbook necessitate that a new edition of this document be distributed to the membership without undue delay; further that the committee therefore expresses great concern regarding the decision of the NCAA Executive Committee to delay approval of funding for the printing and distribution of a new edition of the Sports Medicine Handbook, since the committee feels the Association has a strong ethical, if not legal, imperative to keep up-to-date versions of this document available to the membership at all times.[318]

202. The next Sports Medicine Handbook was subsequently published in October 1983. As with the 1981 edition, its shocking inadequacy with regards to brain injury remained with its singular mention.[319] There was much, however, in the handbook about lawsuits in college athletics.[320] At a time when leading researchers were questioning before US Congress whether helmets could protect against concussions, calling attention to the dangers of recurrent concussions, and making clear that there was little difference between blows suffered in one context versus others, the NCAA continued to have no concussion policies.

[317] NCAA CSMAS Minutes January 8-9, 1983, p. 7.
[318] NCAA CSMAS Minutes, June 8-9, 1983, p. 6.
[319] NCAA. 1983. *Sports Medicine Handbook*. Kansas. p. 15.
[320] NCAA. 1983. *Sports Medicine Handbook*. Kansas. e.g. pp. 8, 9, 21.

F. Brain Injury Research and the Colorado Medical Society Guidelines, 1984-1990

203. In 1987 the NCAA published yet another edition of the Sports Medicine Handbook. By that edition, the health questionnaire had vanished. In other words, there was no mention of concussion at all. None would appear until 1994. The medical and scientific literature, meanwhile, was filled with important new studies that the NCAA's leaders and medical advisors could have read. A sample from the period 1984 to 1990 includes:

204. In 1984 a neurologist and scientists in family medicine in an analysis of the epidemiology of Alzheimer's disease found a slight, statistically significant, relationship between a prior history of head injury and dementia.[321] In 1986 a neurosurgeon reviewed the trends of concussion research and hypothesized that the reversal of neural dysfunction normally seen following concussion was due to the unexcitability of axonal membranes following primary mechanical strains. He observed that it was unknown why some dysfunctions persisted but suggested it may be due to permanent structural changes in axons or neural networks.[322] In 1987 two doctors performed a controlled study to assess whether trauma could be a cause of ALS and found that 58% of 135 respondents who had developed the disease before age 45 reported having sustained injuries – trauma – prior to the onset of the disease.[323] In 1989 a pathologist described the pathology of repeated head trauma using boxers as an example; he confirmed the presence of tangles but absence of amyloid plaques and observed that current advanced imagining techniques cannot show the incipient disintegration of living fiber pathways or groups of neurons.[324] In 1990 neurologists and pathologists described in a brief notice evidence of chronic traumatic encephalopathy in a woman with a history of intimate partner violence – a finding indicating further evidence that exposure to hits not context mattered.[325]

205. Among these publications – all of which could have informed the actions undertaken by the NCAA – two stand out sharply. The first was a 1984 study that appeared in the *Journal of the American Medical Association* on what the authors termed "Second Impact Syndrome."[326] This study described yet another way that concussions could be cumulative injuries by calling attention to the way that sequential

[321] Heyman, A. *et al.* 1984. "Alzheimer's Disease: A Study of Epidemiological Aspects." *Annals of Neurology* 15., p. 337.
[322] Gennarelli, T.A. 1986. "Mechanisms and pathophysiology of cerebral concussion." *Journal of Head Trauma and Rehabilitation.* 1. 2., pp. 23-29.
[323] Gallagher, J.P.; Sanders, M., 1987. "Trauma and amyotrophic lateral sclerosis: a report of 78 patients." *Acta Neurologica Scandinavica*. 75. 2., pp.145-150.
[324] Corsellis, J.A. 1989. "Boxing and the Brain." *British Medical Journal.* 298. 6666, pp. 105-09.
[325] Roberts, G. W. *et al.* 1990. "Dementia in a Punch-Drunk Wife." *The Lancet* 335, pp. 918-919.
[326] Saunders, Richard L.; Harbaugh, Robert E. 1984. "The Second Impact in Catastrophic Contact-Sports Head Trauma." *Journal of the American Medical Association* 252. 4, pp. 538-539.

minor impacts "may occasionally lead to major cerebral pathological conditions."[327] That event was often deadly. The authors observed: "The incidence of lethal head trauma in football has not changed despite major refinements in protective gear. This observation is compatible with a hypothesis of additive or compounded effects of minor impact head injuries."[328] The authors noted that athletes were often motivated to return to play. They worried that return to play guidelines were arbitrary.

> Schneider in 1973, believed a "minor" concussion did not preclude return to the football game. Quigley's rule in 1945 stated that three concussions in one season dictated discontinued participation in that sport. Such arbitrary rules were appropriate when no reasonable complements to clinical experience and judgment existed. Clinical data alone, however, may now be inadequate with the availability of reliable and noninvasive means of diagnostic brain imaging. We suggest that in the athlete who has suffered a minor head injury, CT scanning should be done before medical clearance for resumption of contact sports if any postconcussive symptoms such as headache, "lightheadedness," dizziness, blurred vision, nausea, or lethargy are present.[329]

206. Equally important was a 1986 paper, the second study, that appeared in the *Physician and Sportsmedicine* and offered a guideline on return to contact sports.[330] The author – neurosurgeon Robert Cantu - opened his review with the observation that one in five high school football players suffered a concussion annually. "Today many physicians are more conservative than ever because (1) the ability to process information is reduced after a concussion, and (2) the severity and duration of functional impairment is greater with repeated concussions."[331] Cantu observed that "after a player has suffered a first concussion, the chance of incurring a second concussion is more than four times greater than for the nonconcussed player." He warned the reader:

> Lawyers read medical journals too, and I know of a neurosurgeon who was successfully sued in excess of $1 million for a case involving the second impact syndrome. Regarding lawyers and lawsuits, I want to make it bluntly clear that although I list guidelines for return to competition in contact sports after concussion, based on the world's literature and more than 20 years of personal experience as a neurosurgeon and football team physician, the final decision is a clinical judgment in every case. This paper is meant to serve only as a guideline; deviation based on the clinical judgment of the treating physician may be entirely appropriate.[332]

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[327] Saunders, Richard L.; Harbaugh, Robert E. 1984. "The Second Impact in Catastrophic Contact-Sports Head Trauma." *Journal of the American Medical Association*. 252. 4, p. 538.
[328] Saunders, Richard L.; Harbaugh, Robert E. 1984. "The Second Impact in Catastrophic Contact-Sports Head Trauma." *Journal of the American Medical Association* 252. 4, p. 539.
[329] Saunders, Richard L.; Harbaugh, Robert E. 1984. "The Second Impact in Catastrophic Contact-Sports Head Trauma." *Journal of the American Medical Association* 252. 4, p. 539.
[330] Cantu, Robert C. 1986. "Guidelines for Return to Contact Sports After a Cerebral Concussion." *Physician and Sportsmedicine.* 14. 10., pp. 75-83.
[331] Cantu, Robert C. 1986. "Guidelines for Return to Contact Sports After a Cerebral Concussion." *Physician and Sportsmedicine.* 14. 10., p. 75.
[332] Cantu, Robert C. 1986. "Guidelines for Return to Contact Sports After a Cerebral Concussion." *Physician and Sportsmedicine.* 14. 10., p. 76.

Cantu followed past examples by offering three grades of concussion, which he tweaked a bit.

> Grade 3. It is not difficult to recognize a severe concussion (unconsciousness lasting five minutes or more). Initial treatment should be the same as the treatment for a suspected cervical spine fracture. The athlete should be transported on a fracture board with head and neck immobilized to a hospital with neurosurgical treatment facilities. All severe concussions should be admitted to check for possible intracranial bleeding. Grade 2. With moderate concussion (unconsciousness lasting less than five minutes), initial management should be the same as for grade 3. Here, though, clinical judgment may dictate that if the period of unconsciousness is brief, and if the athlete has no neck problems after regaining consciousness, removal on a fracture board may not be necessary. But the athlete should be removed from the game and evaluated by a neurologist at a medical facility. Grade 1. The mild concussion is the most difficult to recognize and judge. The patient does not lose consciousness but suffers from impaired intellectual function, especially in remembering recent events and in assimilating and interpreting new information. Grade 1 concussion occurs most frequently (more than 50% of concussions) and often escapes medical attention.[333]

207. Cantu advised in the remainder of the paper that if an athlete with a first concussion of mild severity felt no symptoms then return to game is permissible. Symptoms made removal from the game mandatory and return on after symptoms had cleared. A second mild concussion, Cantu stated, demanded removal from competition for at least two weeks. These protocols became more stringent in Grade 2 concussions. Athletes with one, could return after a week, but two required removal for a month and contemplation of ending the season. A grade 3 concussion meant that the athlete could not play for a month and two terminated the season. If there was any evidence of postconcussion syndrome for all grades, return to competition was to be prevented.[334]

208. Cantu's guidelines were hardly original. As described above, guidelines like his had appeared in the 1950s, 1960s, and 1970s. The NCAA, having no policy on concussions, and seemingly possessing little interest in brain injury research in general, had never adopted any return to competition guideline since the 1933 medical handbook. The lack of a policy came up in the minutes of the CSMAS in February 1985:

> Citing the example of the death during the past football season of a junior college player who apparently was inappropriately allowed to return to participation in a game after being knocked unconscious, the committee began discussion of the lack of any standards for return to competition after a head injury. While it was agreed that the lack of such standards in the past probably reflected a lack of consensus within the medical community as to what those standards should be, the committee agreed that it was reasonable to make an effort to develop a standard, preferably in cooperation with an appropriate national medical organization. After further discussion it was agreed that Dr

[333] Cantu, Robert C. 1986. "Guidelines for Return to Contact Sports After a Cerebral Concussion." *Physician and Sportsmedicine.* 14. 10., pp. 76-7.
[334] Cantu, Robert C. 1986. "Guidelines for Return to Contact Sports After a Cerebral Concussion." *Physician and Sportsmedicine.* 14. 10., pp. 76-83.

> [Carol] Tietz would contact the American Neurological Association and Ms [Daphne] Benas would obtain the results of a current study of this topic being conducted at the University of Virginia….[335]

209. Despite noting the death of college player, despite Cantu's publication in the following year, and despite as well the appearance of follow-up discussions within the CSMAS,[336] no guidelines emerged from the NCAA in the years 1986, 1987, 1988, 1989, 1990, 1991, 1992, and 1993. There was also no discussion of Second Impact Syndrome.

210. Such was not the case in medicine. The Colorado Medical Society published Guidelines on Sports Concussion in a forceful and short document that appeared in 1990 and that offered a model that could have been adopted or endorsed by any concerned organization. In the revised edition published in 1991, the authors explained that the sports guidelines "were developed by the CMS Committee on School Health and Sports Medicine in 1990 out of a growing concern that many team physicians in attendance at contact sports events felt uncomfortable when asked to determine whether an athlete could return to the contest following a concussion."[337] The guidelines were endorsed by several leading medical organizations: the American Academy of Pediatrics; the American Academy of Sports Physicians; the American College of Surgeons – Committee on Trauma; the Colorado Society of Clinical Neurologists; and the University of Colorado – Department of Neurology, University of Colorado – Division of Neurosurgery.

211. It is worth quoting the description of circumstances in their 1991 edition:

> Concussion is the most common consequence of head injury in contact sports. It is estimated that more than 250,000 such injuries occur every year in football alone. Head and neck injuries are the most frequent catastrophic sports problem. While these injuries can occur in any athletic activity, they are most common in football, boxing, horseback riding, swimming, diving, cycling, ice hockey, gymnastics, martial arts, sky diving, rugby, and motorized vehicle racing. Current information regarding head injuries must bring new respect for what is frequently dismissed as an athlete having suffered a "ding" injury. Several observations call into question the very concept of "minor" head injury: 1) Brain injury in sports can result from any rotational (angular) or translational (linear) force applied to the head. Frequently, both forces act in combination. Rotational forces more commonly cause loss of consciousness associated with deep shearing injuries of nerve fibers (diffuse axonal injury or DAI). Translational forces are less likely to cause unconsciousness but more commonly lead to skull fractures, intracranial hematomas, and cerebral contusions, 2) Central nervous system axons are more vulnerable to the shearing forces of mild head injury than the surrounding glia and vascular tissues, 3) It has long been recognized, although underappreciated, that confusion and amnesia can result from concussion even without loss of consciousness, 4) Current neuroimaging techniques of magnetic resonance imaging (MRI) and computerized tomography (CT) frequently detect

[335] NCAA CSMAS Minutes, February 7-8, 1985, p. 6.
[336] See NCAA CSMAS Minutes, January 29-30, 1986 p. 3; and NCAA CSMAS May 6-7, 1986, p. 3.
[337] Sports Medicine Committee of the Colorado Medical Society, *Guidelines for the Management of Concussion in Sports*, Colorado Medical Society 1 (June 1991).

> intracranial lesions following mild head trauma, even without loss of consciousness. MRI has proven to be more sensitive than CT in detecting intracranial pathology, especially the nonhemorrhagic lesions of DAI prevalent in closed head injury, 5) Information processing ability can be reduced following concussion. Twenty-five percent of athletes with three minor head injuries, 3% of those with four minor head injuries, and 40% of those with five minor head injuries showed persistent abnormalities on neuropsychological testing at 6 months after injury, 6) Repeated concussions appear to impart cumulative damage, resulting in increasing severity and duration with each incident, 7) In football, the chance of having a second concussion is four times greater than the chance of sustaining a first concussion, 8) Amnesia following mild head injury frequently takes several minutes to appear, suggesting that some neuropathological process evolves slowly over time after the mechanical blow, 9) The Second Impact Syndrome, although rare, can result in catastrophic brain swelling which may occur following a second minor head injury in individuals who are still symptomatic from a prior concussion.[338]

212. Looking back into the wider context of the history of medicine, the Colorado Medical Society's guidelines for the management of concussion in sports appear an updated acknowledgement of the advanced state of concussion research after more than a century of medical and scientific research. The NCAA, finally, began contemplating adding a statement to the Sports Medicine Handbook in 1993.[339] It was six decades after they had published their 1933 handbook which had clarified the relationship between repeated concussions and chronic traumatic encephalopathy.

213. To summarize the whole of this section, the period from 1970 to 1990 saw numerous publications appears in high quality medical and scientific journals further elaborating the risks of concussions and worse brain injuries. More studies noted that trauma could account for Parkinsonianism, dementia, personality changes, intellectual deficits, memory problems, and associations with diseases like Alzheimer's had also been established. A growing biomechanical literature served to aid the emergence of new standards for helmets while also explaining the way in which forces interacted on the brain in blunt force head trauma. Clinicians had also demonstrated that concussions were cumulative injuries, with effects ranging from intellectual deficits to death. Investigators had also published studies examining the traumatic origins of ALS. Epidemiologists had begun to add population level data to those studies, while researchers in sports medicine had published a steady stream of return to competition guidelines. Decades of research had culminated in testimony before Congress in 1983 that hits to the head in contact sports could result in chronic traumatic encephalopathy. Decades of research had also culminated in the Colorado Medical Society guidelines.

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[338] Sports Medicine Committee of the Colorado Medical Society, *Guidelines for the Management of Concussion in Sports*, Colorado Medical Society 1 (June 1991), p. 2.
[339] NCAA Sports Sciences Research Subcommittee of the CSMAS, Minutes February 8-9, 1993, p.4.

214. The most generous interpretation of the NCAA's work during this period is that they sought to protect students participating in sports from acute catastrophic head injury. Their attention appears to have been focused on those fatalities that resulted from the absolutely most severe hits that could occur in football. Developing helmet standards may have helped, but for any brain injury less than one that caused death within hours or days, the NCAA's leadership appears to have shrugged its shoulders of any responsibility and treated all findings in the published literature or made in public pronouncements as though they were hiding in plain sight. They continued to demonstrate a pattern of ossification and inertia on brain injuries, slow to adopt any changes to protect students participating in athletics. The NCAA warned no one of knowable, preventable risks. The NCAA struggled to institute rule changes. The NCAA struggled to enforce policies in their own updated medical handbook, and it appears that the NCAA never contemplated engaging in enforcement activities that would have pushed their members to take a proactive approach to student wellbeing.

XI. THE NCAA AND BRAIN INJURY RESEARCH, 1990-2005

215. In assessing the NCAA's actions in the context of the history of brain injury research as this report has done, it is easy to lose track of the big picture. The NCAA's defensiveness and complacency undoubtedly exposed students participating in contact sports to grievous harm. At the same time, it also needs to be remembered that football was a major driver of the NCAA's revenue and supported many of its other programs. In effect, many people in many parts of the organization had conflicts of interest that would have made internal self-awareness hard.

216. The NCAA was hardly a weak organization when it came to regulating student and institutional behavior. They had powerful enforcement capacity when it came to managing what they deemed the ideals of amateurism, and they wielded that enforcement capability like a weapon. Moreover, by the 1990s the NCAA had started using its enforcement power aggressively when it came to requiring drug testing of students. The students challenged in courts the testing as a violation of their privacy, and the NCAA argued as a defense that aggressive drug testing was necessary to protect the health and safety of athletes.[340] The records of the CSMAS do not reflect any evidence from the period before 1990 that the NCAA conducted enforcement action (or even evidence that they contemplated such actions) against a

[340] Jennifer Hill et al v. National Collegiate Athletic Association, Supreme Court of California, 28 January 1994, p. 18: "In considering whether the *NCAA*'s drug testing program violated plaintiffs' state constitutional right to privacy, the trial court and the Court of Appeal required the *NCAA* to demonstrate that its drug testing program advanced a "compelling state interest" by proving each of the following: (1) the program furthered its stated purposes, i.e., to safeguard the integrity of athletic competition and to protect the health and safety of student athletes; (2) the utility of the program manifestly outweighed any resulting impairment of the privacy right; and (3) there were no alternatives to drug testing less offensive to privacy interests."

student, team, or institution when it came to preventing head injuries in football and compliance with preventative remedies for head injury. For example, the NCAA never appears to have audited whether institutions were in compliance with the requirements that helmets carry the NOCSAE warning label. Could they say with certainty that all institutions met this most modest of demands? It appears that they could not.

217. Thus while the NCAA could wield its enormous power in any number of ways to enforce the amateur ideal, it chose not to wield that same power to confirm that their members were compliant with even their most minimal efforts to ensure brain health in a population, who obviously had to use their brains in an academic context. Yet as G. Dennis Wilson said in a later deposition, there was no power higher than the NCAA's to do so.[341] It is not a stretch at all to see that the academic cheating scandals that plagued the NCAA partially emanated from their lack of concern about the cumulative effect of concussions experienced in contact sports on the intellectual ability of students.[342]

218. Despite these observations, it might seem unthinkable that once the NCAA had finally published a new concussion guideline in 1994 that they could do worse than they had done in the previous six decades. In fact, a review of its 1994 guideline and internal documents from the period after 1990 to 2005 indicates that the organization became increasingly defensive and its leadership acted in ways that exaggerated uncertainty about science and medicine and erred to the least drama while diminishing student awareness about trends in brain injury research. The 1994 concussion guideline stands out for its lack of forthrightness – and future versions would acquire further opacity. Meanwhile the NCAA's response to new trends in brain injury research echoed its long-established pattern. The NCAA was indifferent to alternative concussion guidelines. It took no aggressive action to remedy its historical intransigence. The NCAA denigrated the advice of outsiders. Only the threat of lawsuits and legislation moved the NCAA.

A. The 1994 Concussion Guideline

219. A whole future pattern of behavior can be inferred from the very language of the 1994 guideline. Where the Colorado Guidelines had been clear, direct, and precautionary, the NCAA guideline put everything in caveats and subordinated clauses. When describing annual occurrences of concussions in high school, for instance, the authors of the guideline elected to say: "one might assume similar risk of injury to college football players."[343] Who was the one supposed to be? Since a reader could assume anything, a critical one might wonder why given that the NCAA was obligated to protect students, they did

[341] Deposition of G. Dennis Wilson, March 31, 2016 in Mathew Onyshko v. NCAA, pp. 139-140.
[342] See, for example, Smith, Jay M., and Mary Willingham. *Cheated: The UNC scandal, the education of athletes, and the future of big-time college sports*. U of Nebraska Press, 2015.
[343] NCAA, 1994. *1994-95 NCAA Sports Medicine Handbook*, p. 40.

not know or chose not to use the words "should assume" which self-evidently would have been more precautionary.

220. Another example can be drawn from the 1994 Guideline's description of "bell ringers" and "dings." Of these concussions, the guideline's authors first observed that they might go unrecognized by coaches, athletic trainers, and team physicians. They then said that "fellow players" might also not recognize the symptoms. That was true. After all, the NCAA had done nothing in the way of student education on concussions, a fact that was mentioned in long-range planning meeting of the CSMAS in 1990, and so students would have little reason to be on the lookouts for symptoms, or know what any of those might be.[344] The medical guideline also said things that in the context of the historical record of medicine and science seem more than a little misleading. The guideline said, for instance, "the cumulative effect of these mild concussion is unknown, so guidelines for sports participation are difficult to establish."[345] Here the authors appeared to be parsing concussions that were allegedly mild, 'bell ringers' and 'dings,' from other altered states of consciousness. They were thereby implying that there was no evidence that those supposedly milder concussions were cumulative injuries. But the best evidence that existed about concussions indicated quite precisely that all concussions could be cumulative injuries, and the NCAA had no evidence to the contrary.

221. Contrast what the NCAA guideline said with what the authors of the Colorado Guidelines had written: "Repeated concussions appear to impart cumulative damage, resulting in increasing severity and duration with each incident" and they had also challenged the very idea that there was such a thing as a minor head injury. Why was the NCAA showing such reluctance to be clear?

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[344] NCAA Memo to CSMAS from Randall W. Dick, Recommendations of Special CSMAS Long-Range Planning Subcommittee April 25, 1990, p. 2. NB: Interestingly, David Klossner, the NCAA's Director of Health and Safety, was asked much later during his congressional testimony in 2010 about whether the NCAA educated student athletes. He stated: "From the NCAA's perspective, we have an NCAA sports medicine handbook that has a guideline on concussions that outlines the risks associated with concussions and return-to-play concerns that is provided to all member institutions that help educate their student athletes on the rules of concussions in sports. Member institutions have responsibility to educate their student athletes. At the end of the day, they make the decisions of what happens with their student athletes and how they educate them on various topics related to their student athlete health." See: "Legal Issues Relating to Football Head Injuries (Part I & II)." *Hearings Before the Committee on the Judiciary House of Representatives One Hundred Eleventh Congress, First and Second Sessions October 28, 2009 and January 4, 2010*, p. 366. Shortly after Klossner's 2010 testimony, as the *Washington Times* reported in 2013, the NCAA's Ty Halpin (Director of the playing rules administration) said an email that Klossner was "trying to force our rules committees to put in rules that are not good" to which the NCAA's Associate Director of Research, Nicole Braken, responded that Klossner reminded her of "a cartoon character." See: https://www.washingtontimes.com/blog/screen-play/2013/jul/20/internal-ncaa-emails-raise-questions-about-concuss/ Accessed 7-21-2019. Ironically, Halpin also claimed later that year during a deposition that he saw "student-athlete safety as the No. 1 part" of the rule's committee's charge. Deposition of Thomas Halpin in Arrington vs. NCAA, 18 April 2013, pp. 9-10.

[345] NCAA, 1994. *1994-95 NCAA Sports Medicine Handbook*, p. 40.

222. Rather than provide clear and transparent warnings to the athletes (students), the NCAA instead denigrated the Colorado Medical Society guideline, using its own words against itself. They said "although these guidelines may assist in clinical decision-making, they are not absolute and should not be substituted for the clinical judgement of the examining physician." What followed that sentence appeared to an indictment of the Colorado Medical Society's approach: "If there are any questions as to the severity of past head trauma, or if the trauma required intracranial surgery, clearance should be deferred…. No athlete should be allowed to return to contact sports on the same day that a grade-three concussion was received."[346] Of course, the Colorado Medical Society had stressed that any one with a grade-three concussion should be out for a month (a fact clarified in the Table the NCAA included after its guideline).

223. Why did the NCAA go to such trouble to separate its approach to concussion management from the Colorado Guidelines? It is the supposition of this report that the authors of the Colorado Guidelines had indicated through its careful selection of cited sources the existence of a whole body of literature on concussions and brain injuries (cited extensively in this report above) that the NCAA's advisers and leader knew based on the NCAA's unique understanding of college football for a nearly a century, the NCAA's clear founding mission, and the body of medical knowledge to which the NCAA had access.

224. The upshot for anyone reading the Colorado Guidelines and that body of literature was clear: NCAA college football players had been exposed to far greater brain injury risks than the NCAA chose to recognize, about which the NCAA was willing to warn, and for which the NCAA would take reasonable precautions to minimize. What the NCAA knew based on its unique position to govern sports and the practice of state-of-the art sports medicine was far greater than any other person or organization in the United States or world-wide. The NCAA had to have known of the body of literature from 1933 to 1994 that was there for anyone to read. The NCAA knew exactly what college football players faced regarding concussions in 1932 and 1933, and the NCAA had the unfettered authority to address that special medical problem. The most favorable reading of the NCAA failure to act is that the NCAA leadership lost sight of the NCAA's founding mission to protect the health and safety of college football players, and the NCAA had converted its mission purposefully to maximizing the profit the NCAA and its membership could reap from monetizing college football and men's college basketball. The NCAA's actions proved effective in protecting the games that created revenue, but not the health and safety of the young men who played those games, put people in the stands, and brought eyes to the television screens. The college students who played major college sports came and went. They were replaced yearly. But the constant for the NCAA was revenue, not the students. Even though the NCAA freely stated that "student-athletes rightfully assume that those who are responsible for the conduct of sport have taken reasonable precautions to minimize the risk

[346] NCAA, 1994. *1994-95 NCAA Sports Medicine Handbook*, p. 40.

of significant injury,"[347] that was not true, not for students who played football. The result for the students was essentially nothing: no clear warnings, no attempt to identify concussions as they happened, no protocol for prevention, and no protocol for treatment, even though some of the best doctors in America had insisted the NCAA take those steps generations before.

B. The American Academy of Neurology's Concussion Guidelines

225. In the mid-1990s publications appeared that added to the picture of medically recommended guidelines,[348] and among them was the Practice Parameter of the American Academy of Neurology.[349] The NCAA had first learned about the Practice Parameter from a 1996 letter sent to Cedric Dempsey, then Executive Director of the NCAA. The letter came from the Presidents of the American Academy of Neurology, the Brain Injury Association, and the American Association of Neurological Surgeons. Their letter is worth quoting in full:

> As you know, the pressure to win can cause an athlete – amateur or professional – to forsake personal safety. Too often, coaches, owners, fans and family expect, and sometimes demand, that an injured player "tough it out" and play through the pain, perpetuating the notion that an athlete who sits out to nurse wounds is weak, selfish, and unwilling to sacrifice for the team. This problem has extended beyond the usual bumps and bruises, to the complex area of brain injury. Concussions – the most common form of damage to the brain – are being overlooked as one of the most serious health problems facing amateur and professional athletes. Expressions like "getting dinged" and "having your bell run" downplay the severity of Level 1 concussions (misleadingly referred to as "minor concussions"). An athlete who suffers a Level 1 concussion should not be told to just "shake it off"; close monitoring is required. Concussions have ended careers, and affected lives away from competition. Brett Lindros, a former member of the New York Islanders, was forced to retire at the age of 20 after suffering 10 concussions. Former New York Jets wide receiver Al Toon, who retired from football in 1992 after nine concussions by age 29, still suffers from painful post-concussion episodes. Quarterback Chris Miller, of the Los Angeles/St. Louis Rams, retired from football last March after suffering five concussion in one season. And former high school soccer player Kate Gilson of Hicksville, NY, who suffered a Level 3 concussion during a game in October 1995, reporting feeling side effects, such as lack of concentration and loss of balance, eight months later. Part of the problem is that coaches and trainers are simply not equipped to properly handle a player who suffers a concussion. They have not been trained to identify the symptoms, and do not know how long a player with a concussion should be kept out of a game. The "playing hurt" mentality may be a factor that keeps coaches and trainers from seeking this information, but the increasing incidence of concussions in sports now demands that action be taken to ensure the safety of amateur and professional athletes nationwide. Please take a look at the enclosed draft copy of the

[347] NCAA, 1994. *1994-95 NCAA Sports Medicine Handbook*, p. 4.
[348] See, for example, Kelly, James P.; Rosenberg, Jay H. 1997. "Diagnosis and management of concussion in sports." *Neurology*. 48, pp. 575-580.
[349] Report of the Quality Standards Subcommittee. 1997. "Practice Parameter: The Management of Concussion in Sports (Summary Statement)." *Neurology*. 48., pp. 581-585.

> American Academy of Neurology's (AAN) Practice Parameter on the Management of Concussion in Sports, as well as the draft palm cards for coaches and trainers. Based on a background paper written by James P Kelly, MD and Jay H. Rosenberg, MD the Practice Parameter recognized the need for standards in treating athletes who suffer concussions during competition, and also offers appropriate short- and long-term standards of treatment of each of the three levels of concussion. In addition, the palm cards define the symptoms, and provide a sideline evaluation to assist coaches and trainers in determining if a player has suffered a concussion and the seriousness of the brain injury. We are confident that your organization could play a vital role in our efforts to introduce these guidelines. We are planning a major public education campaign, beginning with a press conference in November, to announce the new guidelines and to focus attention on the often-overlooked problem of concussions in sports. Utilizing current and former professional athletes, all of whom have suffered numerous concussions, we will target our message – that there is no such thing as a minor concussion – to athletes from pee-wee leagues to the pros. Specifically ,we are asking you and your organization to endorse the Practice Parameter and join us in our campaign. You will be lending your name to an initiative that will result in safer playing conditions for athletes of all ages and concussions in future athletic contests. In addition, you will also receive the benefits of having your organization's name visible at the press conference, on collateral materials, and at future media events.[350]

226. Give that this letter had come from the Presidents of nationally recognized expert neurological organizations and that its content was uncontroversial, the NCAA should have endorsed it but did not. In keeping with it past pattern of delay, avoidance, and evasion, as if the medical safety issue was one the NCAA should dodge, the Sports Sciences Safety Subcommittee of the CSMAS recommended not to support the parameters of the conference. The minutes state as follows:

> The subcommittee reviewed a request for the NCAA to endorse the American Academy of Neurology's Practice Parameters on the Management of Concussion in Sport and to support financially a June 1997 meeting on this subject. It was noted that some of these parameters were unduly restrictive in the college environment, especially in less severe concussions. It was noted also that many of these recommendations were not based on formal scientific research. Citing the lack of consensus among the medical community regarding quantifying concussion severity and return to play after such events, ***the subcommittee recommended not to support the parameters of the conference.***[351]

227. The NCAA leadership chose a different path and dismissed the recommendation as "unduly restrictive" and lacking in "consensus". Given the signatories of the letter, it is difficult to understand what "consensus" the NCAA was waiting for. The NCAA appears to have never notified students, coaches, athletic directors, trainers, or parents that a "consensus" was a pre-condition for a precautionary standard of safety with respect to concussions, including repeat concussions. Certainly, a "consensus" was present in 1932 and 1933, and the "consensus" was about identifying, treating, and preventing concussions, particularly repeat concussions, from the sidelines. The medical advisors who

[350] NCAA Letter from Kenneth M Viste, George Zitnay, and Charles Rich to Cedric Dempsey, 27 August 1996.
[351] My emphasis. NCAA Minutes of the Sports Sciences Safety Subcommittee of the Committee on Competitive Safeguards and medical Aspects of Sports, February 3-4, 1997, p. 3.

wrote the NCAA's 1933 Medical Handbook had formed a consensus on student safety with respect to concussions in football.

228. Whatever "consensus" the NCAA claimed it was waiting for, it was not related to the safety of students. The only reasonable inference for the NCAA's decision was that it chose to delay imposing safety requirements on the game, coaches, and trainers NCAA leadership thought would be an imposition, even though it would have protected the students. The NCAA, leadership, for example, never defined what "consensus" meant and why the concussion protocols recommended by Nichols in 1906 and Fauver, Thorndike, and Raycroft in 1933 could not be trusted. The choice to do nothing was, in fact, a malevolent decision, and the NCAA began to use the language of "consensus" in its Sports Medicine guideline in the revised edition that appeared in 1997.[352] The NCAA had so departed from its mission to protect students from injury that its 1997 revision of it recommended (not mandatory) concussion guidelines rejected the spirit of the return to play guidelines set out in the Colorado Guidelines.[353]

C. Brain Injury Research, 1990-2005

229. Dr Bennett Omalu published the pivotal case study of CTE in an NFL player in 2005.[354] Omalu provided pathological evidence on autopsy that repetitive mild trauma to the head resulted in encephalopathy for Mike Webster, an NFL Hall of Fame player. Omalu was not working in a vacuum. He relied on methods published by Jennian Geddes who had published two major studies of CTE in boxers in the 1990s.[355] Commenting on Omalu's findings, a neurosurgeon with extensive experience in brain injury research, Robert C. Cantu, observed that Omalu's publication "should come as no surprise".[356] Cantu's own record justified his statement. In 1996, Cantu had written:

> the late effects of repeated head trauma of concussive of even subconcussive force leads to the anatomical patterns of chronic brain injury with correlating signs and symptoms. Martland first introduced the term "punch drunk" (demential pugilistica) in 1928. Although first described in boxers, this traumatic encephalopathy may occur in anyone subjected to repeated blows to the head from any cause.[357]

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[352] NCAA. 1997. *1997-98 NCAA Sports Medicine Handbook* p. 44.
[353] Deposition of G. Dennis Wilson, March 31, 2016 in Mathew Onyshko v. NCAA, pp. 149-150.
[354] B.I. Omalu *et al*., 2005. "Chronic Traumatic Encephalopathy in a National Football League Player." Neurosurgery. 57. 1, pp. 128-34.
[355] Geddes, J.F. *et al*. 1996. "Neurofibrillary Tangles, but not Alzheimer-type Pathology, in a Young Boxer." *Neuropathology & Applied Neurobiology.* 22. 1, pp. 12-16; Geddes, J. F. *et al*. 1999. "Neuronal cytoskeletal changes are an early consequence of repetitive head injury." *Acta Neuropathology*. 98. 2., pp. 171-78.
[356] Cantu, Robert C. 2005. "Comments." *Neurosurgery.* 57. 1., p.133.
[357] Cantu, Robert. C. 1996. "Head injuries in sports." *British Journal of Sports Medicine*. 30, p. 291.

230. Cantu was not alone. The same observation had been made in every decade back to the 1920s.[358] A few years before neuropsychologists Ruben Echemendia and Laura Julian warned in 2001 that brain injuries and psychological symptoms followed head injuries in sports, they also warned that a critical issue in sports neuropsychology was "the consequences of allowing an athlete to return to sport following multiple mTBI [mild traumatic brain injury] can include chronic cognitive deficits and possibly dementia pugilistica."[359] Nothing has occurred since then to prove these authors wrong.

231. In the 1990s a change took hold in the specialty of sports medicine.[360] Some scientific and clinical writers increasingly claimed that the historical record offered little consensus or useful research on concussion that occurred in sport. They pointed to single moments in the records that may have shown normal scientific controversy and concluded from these that both the definition of concussion was controversial and that there was no universal agreement about it. It is a noteworthy feature of the historical record that many of the authorities who have expressed concern after 1990 that the definition of concussion failed to achieve "universal agreement" studied what they called "sport concussion" or "sport-related concussion" as a trending topic in the comparatively new clinical specialty sports medicine. Increasingly specialists implied, intentionally or otherwise, that concussion in sports was a special case and different from concussion generally. The implication was that conclusions and knowledge about brain injuries established in the wider medical sphere over the previous century were in some way unsatisfactory when it came to sports concussion.

232. Consider the following example: In 2001 Karen M. Johnston, Paul McCrory, Nicholas G. Mohtadi, and Willem Meeuwisse authored an essay in the *Clinical Journal of Sports Medicine* entitled "Evidence-Based Review of Sport-Related Concussion: Clinical Science". The authors began their article by declaring that there was "no universal agreement on the standard definition or nature of concussion." They observed: "Despite over 1000 years of conceptual development, the diagnosis and management of concussion remains controversial." The historical context, they asserted, "refers to a transient disturbance of neurologic function caused by the 'shaking' of the brain that accompanies low velocity brain injuries."[361] To evidence their claims, these authors pointed to writings from medical antiquity, the early modern period,

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[358] It is worth noting that Wood's 1911 paper investigating trauma and ALS was also echoed in 2005. See Chio, A., Benzi, G., Dossena, M., Mutani, R. and Mora, G., 2005. "Severely increased risk of amyotrophic lateral sclerosis among Italian professional football players." *Brain*. 128. 3., pp.472-476.

[359] Echemendia, Ruben J.; Julian, Laura J. 2001. "Mild Traumatic Brain Injury in Sports: Neuropsychology's Contribution to a Developing Field." *Neuropsychology Review.* 11. 2., p. 83.

[360] It seems likely that the classic study by Barth, J. T. *et al*. 1989. "Mild Head Injury in Sports: Neuropsychological Sequelae and Recovery of Function." In eds. Harvey S. Levin, Howard M. Eisenberg, and Arthur L. Benton. *Mild Head Injury*. Oxford. Oxford University Press. pp. 257-275 indicated, perhaps originated, the sociological trend.

[361] Johnston, K.M. et al. 2001. "Evidence-Based Review of Sport-Related Concussion: Clinical Science." *Clinical Journal of Sports Medicine*. 11. 3, pp. 150-59.

and the late eighteenth century.[362] They also selected a couple of mid-twentieth century writings by Derek Denny Brown and William Ritchie Russell, the 1966 definition offered by the Ad Hoc Committee to Study Head Injury Nomenclature of the Congress of Neurological Surgeons, and the original studies detailing the Glasgow Coma Scale, a standard means of distinguishing severity of brain injury that was published in 1975. Noting that in their view the Glasgow Coma Scale could not be used to distinguish what they called sport-related concussion, the authors stated: "Current definitions of concussion remain unsatisfactory from the sporting injury standpoint."[363]

233. Some of the profound limits introduced by the notion of a "sports concussion" are manifest in a 2005 international meeting in Prague and consensus proceedings published afterwards. The authors purported to have revised a definition of concussion from that proposed by a 1966 Ad Hoc Committee to Study Head Injury Nomenclature working within the Congress of Neurological Surgeons. The Prague group's revised definition stated: "**Sports concussion** is defined as a complex pathophysiological process affecting the brain, induced by traumatic biomechanical features."

> Several common features that incorporate clinical, pathological, and biomechanical injury constructs that may be used in defining the nature of a concussive head injury include the following. (1) Concussion may be caused by a direct blow to the head, face, neck, or elsewhere on the body with an "impulsive" force transmitted to the head. (2) Concussion typically results in the rapid onset of short lived impairment of neurological function that resolves spontaneously. (3) Concussion may result in neuropathological changes, but the acute clinical symptoms largely reflect a functional disturbance rather than structural injury. (4) Concussion results in a graded set of clinical syndromes that may or may not involve loss of consciousness. Resolution of the clinical and cognitive symptoms typically follows a sequential course. (5) Concussion is typically associated with grossly normal structural neuroimaging studies. No changes were made to the definition by the Prague Group beyond noting that in some cases post-concussive symptoms may be prolonged or persistent.[364]

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[362] Johnston, K.M. et al. 2001. "Evidence-Based Review of Sport-Related Concussion: Clinical Science." *Clinical Journal of Sports Medicine*. 11. 3, pp. 150-59.

[363] Johnston, K.M. et al. 2001. "Evidence-Based Review of Sport-Related Concussion: Clinical Science." *Clinical Journal of Sports Medicine*. 11. 3, pp. 150-59.

[364] McCrory, P. et al., 2005. "Summary and agreement statement of the 2nd International Conference on Concussion in Sport, Prague 2004." *British Journal of Sports Medicine* 39. 4 (Suppl I), p. i78. The most recent consensus is McCrory, Paul, Willem Meeuwisse, Jiří Dvorak, Mark Aubry, Julian Bailes, Steven Broglio, et al. "Consensus statement on concussion in sport—the 5th international conference on concussion in sport held in Berlin, October 2016." *British journal of sports medicine* 51, no. 11 (2017): 838-847.Subsequently, the Concussion in Sports Group has come under withering criticism for their process, conflicts, lack of transparency, exclusionary politics, and poor distinction between realities for professional athletes and amateur athletes, see: the investigative journalism by Jeremy Allingham, 2020, "Brain Trust: Big questions surround the most influential concussion research on the planet." https://newsinteractives.cbc.ca/longform/brain-trust accessed on 19 May 2021, which was awarded the Radio Television Digital News Association's Award for Excellence in Sports Reporting. Academic scholars have also be highly critical, see: Partridge, Bradley, and Wayne Hall. "Conflicts of interest in recommendations to use computerized neuropsychological tests to manage concussion in professional football codes." *Neuroethics* 7, no. 1 (2014): 63-74 who expressed urgent concerns about the way neuropsychological testing companies appeared to be influencing the process invisibly to other members: "But it appears that the panel contributing to the 3rd Consensus

234. Not only did that definition provide no clear explanation for why it differentiated sports concussion from brain concussion, it is not clear that it represented anything more than a natural extension of greater scientific precision from the 1966 definition, which defined concussion as "A clinical syndrome characterized by immediate and transient impairment of neural function, such as alteration of consciousness, disturbance of vision, equilibrium etc., due to mechanical force."[365] For that matter, the Prague definition was not all that different from the slightly earlier definition of mild traumatic brain injury introduced in 1993 in the *Journal of Head Trauma and Rehabilitation*, which effectively stated the same thing:

> A patient with mild traumatic brain injury is a person who has had a traumatically induced physiologic disruption of brain function, as manifested by at least one of the following: 1. Any period of loss of consciousness, 2. Any loss of memory for events immediately before of after the accident, 3. Any alteration in mental state at the time of the accident (eg, feeling dazed, disoriented, or confused), and 4. Focal neurological deficit(s) that may or may not be transient; but where the severity of the injury does not exceed the following: loss of consciousness of approximately 30 minutes or less; after 30 minutes, an initial Glasgow Coma Scale (GCS) of 13-15; and posttraumatic amnesia (PTA) not great than 24 hours.[366]

235. Nonetheless, this new specificity for the definition of sport concussion in the Prague statement resulted in the authors claiming:

> At this time, there is no existing animal or other experimental model that accurately reflects a sporting concussive injury. It is noted that, in experimental models, of more severe injury a complex cascade of biochemical, metabolic, and gene expression changes occur. Whether similar metabolic changes occur in sports concussion, however, remains speculative at this time.[367]

236. Thus, among some sports medicine figures there arose a claim that the difference between sport concussion and brain concussion was great enough to make longstanding and ongoing findings in concussion research elsewhere in medicine potentially distinguishable from sport concussion injuries. A distinction that conveniently implied that severe warnings of the potential long term consequences of single

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Statement did not regard such third party links as "special interests" that may influence judgement. For example, the first author of the 3rd Consensus Statement (McCrory) had elsewhere disclosed continuous research funding from CogState since 2001, but he did not disclose this on the 3rd Consensus Statement. While a declaration of such interests would be a minimum requirement, such a conflict of interest could arguably be avoided by his deciding not to participate in drafting the guidelines (p. 68)."

[365] Congress of Neurological Surgeons. 1966. Report of the Ad Hoc Committee to Study Head Injury Nomenclature. *Clinical Neurosurgery*. 12, 388.

[366] American Congress of Rehabilitation Medicine. 1993. "Definition of mild Traumatic Brain Injury." *Journal of Head, Trauma Rehabilitation*. 3, pp. 86-87.

[367] McCrory, P. et al., 2005. "Summary and agreement statement of the 2nd International Conference on Concussion in Sport, Prague 2004." *British Journal of Sports Medicine* 39. 4 (Suppl I), p. i79.

and repeated concussions researched and relied upon in general medicine and neurology over the preceding century were irrelevant to sports.[368]

237. The apparently increasing isolation of sports concussion from brain concussion research was not inevitable, and several early figures studying sports concussion initially imagined that sports arenas might provide an ideal testing ground for exploring minor traumatic brain injuries.[369] A preface by neurologist James Kelly to a special issue of the *Journal of Head Trauma and Rehabilitation* in 1998 contrasts starkly with the aforementioned discussion. Kelly had by then become a prominent figure in the development of concussion management guidelines for athletes. In his opening remarks, Kelly acknowledged that "sports-related concussions" were not usually the kind of injuries that regular readers of the journal might expect to see in the pages of that journal, because, as he put it with a rhetorically open-ended question: "Is it not true that most people who sustain concussion recover spontaneously without professional help?"[370] At the same time, Kelly argued that sports concussion could be seen as a specific case useful for informing more general study:

> It is intriguing to think of the occurrence of concussion in sports as an opportunity to study traumatic brain injury in a truly unique way. The sports arena serves as a laboratory setting for the advance of athletic injury. The opportunity to learn about traumatic brain injury in this way has not been fully explored, and the obligation of health care professionals to do so for the safety of athletes is only now coming into public discussion…we usually have eyewitness reports of the concussion and its effects on the individual. We frequently have videotape images of the blow that caused the concussion, often from two or three different angles. We can test helmets and playing surfaces that were involved. None of these factors are typically available for review and analysis by professionals examining patients in the general population who sustain concussion from other more common causes. Athletes and society in general stand to benefit from improvements in neuroscience as applied to the sports setting….[371]

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[368] It is important to note that from the mid-1990s through to the present, evidence for the association of head injury and the onset of Alzheimer's, Parkinsonianism, and Amyotropic Lateral Sclerosis continued to mount in ways that aligned with historical patterns. See Fleminger S, Oliver DL, Lovestone S*, et al* "Head injury as a risk factor for Alzheimer's disease: the evidence 10 years on; a partial replication" *Journal of Neurology, Neurosurgery & Psychiatry* 2003;74: 857-862; Schofield, P. W., M. Tang, K. Marder, K. Bell, G. Dooneief, M. Chun, M. Sano, Y. Stern, and R. Mayeux. "Alzheimer's disease after remote head injury: an incidence study." *Journal of Neurology, Neurosurgery & Psychiatry* 62, no. 2 (1997): 119-124; Goldman, Samuel M., Caroline M. Tanner, David Oakes, Grace S. Bhudhikanok, Anjali Gupta, and J. William Langston. "Head injury and Parkinson's disease risk in twins." *Annals of Neurology* 60, no. 1 (2006): 65-72; Chen, Honglei, Marie Richard, Dale P. Sandler, David M. Umbach, and Freya Kamel. "Head injury and amyotrophic lateral sclerosis." *American Journal of Epidemiology* 166, no. 7 (2007): 810-816.

[369]For a discussion, *see* Bender, S. 2004. "Historical Perspectives." In M.R. Lovell *et al*., *Traumatic Brain Injury in Sports: An International Neuropsychological Perspective.* Lisse. Swets & Zeitlinger Publishers.

[370] Kelly, J.P. 1998. "Preface." *Journal of Head Injury Rehabilitation.* 13, 2. p. v.

[371] Kelly, J.P. 1998. "Preface." *Journal of Head Injury Rehabilitation.* 13, 2. pp. v-vi.

238. In other words, in the study of concussion in sport, Kelly highlighted the great opportunity to study concussion that was simply not available in other settings. Athletic sports provided a controlled setting with unequalled possibilities for data collection that applied both to athletes and the population at large.

239. On its face, the disconnect between these two points of view was that concussion researchers saw athletic populations as naturally illustrative for studying concussion among non-athletic populations. Sports concussion researchers, meanwhile, were arguing increasingly in this period that there was no applicability from concussion research on non-athletic populations. The emergence of the category "sport concussion" thus represented a significant departure from historical patterns of concussion research and management.

240. As we now know from the result of investigative journalism, from the mid-1990s on the National Football League was involved in a concerted effort to manipulate research and mislead representations of the severity of concussion experienced by professional contact sports athletes.[372] Such efforts sought to underplay the potentially long-term risks or damaging effects of concussion and repeated exposure. The campaign of misinformation conducted by the NFL and affiliates should leave anyone with a profound sense of unease. Given the politics surrounding concussions and contact sports that emerged in the 1990s, the efforts to single out "sports-concussion" from general medicine and scientific findings on head injury as a whole bring to mind the tobacco industry. Indeed, assertions of the different nature of safety concerns accompanying "sports concussion" bares some similarity to the way that light cigarettes were framed and marketed. Tobacco companies, according to medical historian Robert Proctor, purposefully sold the light cigarette as a 'healthy' alternative to regular cigarettes, which they knew entirely to be a medical fabrication.[373] This report does not suggest that any of the authors cited above were engaged in a similar deception. There appears to have been no obvious intention to mislead behind the emergence and growth in popularity of the notion of distinct "sports concussion," as opposed to concussions experienced in other walks of life. Nevertheless, the formulation of "sports concussion" as a concept exaggerated uncertainty and inconsistency in the medical record in a context where broad concerns about litigation were mounting and the informed consent of employees and students a point of contestation. Rather than the product of an overt conspiracy, the author of this report prefers to believe the notion of a 'sports concussion' likely arose in sports medicine and sports psychology from the same place as the hostile reaction that had manifested within the NCAA towards the Colorado Medical Society guidelines. In effect, writers like Cantu, Geddes, and later Omalu were telling them that a body of literature that had been in existence for

[372] Fainaru-Wada, M.; Fainaru, S., 2014. *League of denial: The NFL, concussions, and the battle for truth*. New York. Three Rivers Press.
[373] Proctor, R.N. 2011. *Golden Holocaust: Origins of the Cigarette Catastrophe and the Case for Abolition* Berkeley. University of California Press. pp. 408-09.

decades not only mattered enormously for them but explained that students, elite amateurs, professional athletes (employed), and even recreational athletes were at far greater risk than they wished to believe.

241. The stakes for the doctors, psychologists, and trainers working in sports medicine and sports psychology were considerable. Those professionals often served teams and worked alongside coaches who made far more money than university and college presidents and were celebrities in their own right. The livelihoods of the physicians, psychologists, and trainers who worked within this environment were built on the institutional nature and viability of football and other collisions sports. Their presence implied institutional compliance and the protection of college players. They were the frontline for institutional responsibility, and the NCAA provided job opportunities for these professionals throughout its 1000+ member institutions. Football, more than any sport save the NCAA men's basketball tournament, historically has paid for the NCAA. Concussions and latent neurological disease threatened to undermine football. Individual self-deception is a predictable human response for an average team physician, athletic trainer, and even medical adviser to sports organizations.

242. In 2003, the NCAA began a process whereby it actively lost its history.[374] In June of that year, librarian Lisa Greer asked Randy Dick to look at items slated for removal to the "Distribution Center".[375] Dick said he would take a look and requested that David Klossner and Mary Wilfert look as well.[376] Included for the possible transfer to the Distribution Center is the Sports Science Collection, which compromised 81 documents, including 26 medical books and "Sports Injuries Handbook, 1933-1961". Among other documents the NCAA is now also missing is the 1970 Bibliography of Sports Medicine, which had been prepared by Kenneth Clarke, who Chaired the CSMAS after September 1973.[377] It is important to understand that prior to transitioning to internet technology, an economic process that

[374] It is important to note that some of the documents enigmatically misplaced included the Sports Injuries Handbook from 1933 to 1961 which the NCAA's document retention policies of publications make clear in both 1995 and December 2003 (after the documents went missing) were to be preserved permanently. From 1995: "7.17.8 Publications. All copies to be retained until the next edition becomes available, at which time supply is reduced to 50 copies; after five years, the supply is reduced to 25 copies, after 10 years, it is reduced to 10 copies, which are kept forever. This policy applies to all NCAA publications except the records books and rules books series. Varying numbers of records books and rules books are retained for sale as back issues.(p. 43)" The language was unchanged in 2003: "Retain all copies until the next edition becomes available, and then reduce supply to 50 copies. After five years, reduce supply to 25 copies. After 10 years, reduce to 10 copies and retain forever. Library keeps three copies."

[375] NCAA Email from Lisa Greer to Randy Dick, June 4, 2003.

[376] NCAA Email from Randy Dick to Lisa Greer, David Klossner, and Mary Wilfert, June 4, 2003.

[377] On Clarke's appointment, see May 29, 1973 Agenda for CSMAS Summer Meeting (GEIS034801). For the bibliography, see: Jack C. Hughston and Kenneth S. Clarke eds. *A Bibliography of Sports Medicine* (American Academy of Orthopaedic Surgeons, 1970). Furthermore the committee that helped prepare this document included Fred Allman, Martin E. Blazina, and Fred Behling (also on the CSMAS). Numerous documents contained in this bibliography and referenced in my works cited below suggest that the NCAA was in possession of knowledge, especially for football and boxing, that provided important details about risks of long term neurodegenerative disease, return to play requirements, and the need to advise athletes of risks that might bar them from continuing sport.

accelerated after 2000, reference sources like that bibliography were routinely relied upon by researchers and policymakers.

243. What happened to those volumes and documents like the bibliography, remains a mystery. The NCAA has never been able to locate them.[378] When asked in a deposition in 2020, David Klossner stated under oath that he did "not know" what had happened to the handbooks. He suggested that he did not "see any other further correspondence about what happened, and [the email] noted the distribution center in there which is a storage area, so I would presume that they were stored not thrown away."[379] Evidently, the documents are lost, most tragically the Sports Injuries Handbooks, 1933-1961.[380]

XII. THE NCAA, 2005-PRESENT

244. If there is a characteristic of good science, it is that it aids prediction. It is not that scientists know what the future will be through scientific methods, but rather that excellence in science increases the probabilities of accuracy. As this report described above, in 1983 at the Ring Commission Hearings before the US Congress while clarifying the dangers of recurrent head trauma for all collision athletes, Dr Robert Patterson had mentioned two NFL players who had retired as a result of concussions, Roger Staubach and Frank Gifford.[381] Unfortunately, Patterson was right. In 2015 newspapers reported that Gifford had died from CTE, the same year that finally legitimate mandatory rules and concussion protocols were put in place as required by the terms of the Arrington Settlement.[382] In that same year, a sample of brains in an American brain bank reported 21 cases of CTE found in brains of 66 athletes with no cases located in a control sample of 132 non-athletes.[383] Gifford, presumably, was one of 110 cases of CTE a team of researchers had observed in National Football League players and reported in 2017.[384] In 2018 an epidemiologist and a medical historian, using that 2017 study as a foundation, calculated that CTE prevalence among

[378] See November 2020 Email exchange with NCAA counsel and plaintiff's counsel in *Finnerty v. NCAA* (Marion County, Indiana).
[379] Deposition of David Klossner September 23, 2020 in the matter of The Estate of Cullen Finnerty v. NCAA, part 3,
p. 60.
[380] We know that they sold these handbooks. See: NCAA "Report of the Treasurer" NCAA Proceedings 1940, pp. 166-167.
[381] American Archive of Public Broadcasting. The MacNeil/Lehrer Report; Ring Commission Hearings. http://americanarchive.org/catalog/cpb-aacip_507-g44hm5393h Accessed on 1-27-2019.
[382] Belson, Ken. 2015. "Frank Gifford had Brain Disease, His Family Announces. *The New York Times*. https://www.nytimes.com/2015/11/26/sports/football/frank-gifford-had-cte-family-says.html Accessed 6-20-2019. See also Email from Sandra Clubb to Barbara Rhodes, 22 June 2015. NCAA_Finnerty_139855.
[383] Bieniek, K.F., Ross, O.A., Cormier, K.A. *et al.* Chronic traumatic encephalopathy pathology in a neurodegenerative disorders brain bank. *Acta Neuropathol* **130,** 877–889 (2015). https://doi.org/10.1007/s00401-015-1502-4, particularly p. 882.
[384] Mez, Jesse et al., 2017. "Clinicopathological Evaluation of Chronic Traumatic Encephalopathy in Players of American Football." *JAMA*. 318. 4, pp. 360-370.

professional National Football Players could be anywhere between 10% and 40%.[385] Patterson's naming of Gifford may have been pure coincidence, but perhaps a better way of understanding his observation is that twentieth century science had been steadily showing that exposure to concussive and subconcussive hits resulted in subsequent neurological disease.[386] In other words, the odds were against anyone with a history of exposure to hits to the head.

245. In 2004 the updated NCAA's sports medicine guideline for concussion turned towards clarity. It stated "there are potentially serious complications of multiple or severe concussion including second impact syndrome, post-concussive syndrome, or post-traumatic encephalopathy."[387] By 2010 the NCAA had updated the sports medicine guidelines to include a rule that stated: "NCAA member institutions must have a concussion management plan for their student-athletes on file with specific components as described in NCAA bylaws."[388]

246. None of these changes had been easy. In December 2009 the Committee on Competitive Safeguards and Medical Aspects of Sports ultimately recommended:

> As part of the committee's on-going evaluation of concussions in NCAA sports, the committee has determined that a common playing rule is necessary to provide an emphasis on the significance of head injuries, their prevalence, and the importance to refer for appropriate medical care. This action is also accompanied by a Concussion in Collegiate Sports Summit in 2010 to address medical management and prevention strategies. In addition, the committee will lead a collaborative educational initiative for coaches, officials, and student-athletes. The committee recommends that the NCAA Player Rules Oversight Panel (PROP) consider a common sport playing rule for concussion in all NCAA sports for which the NCAA writes rules as well as adopt a modification to playing rules not governed by the NCAA. The intent is similar to the rules pertaining to blood across sports and charges the referee to remove a student-athlete if they see a noticeable sign of a possible head injury. The medical care and return to play decisions are an institutional responsibility as with other medical conditions. Specifically, the committee recommends the adoption of a rule that states: (a) An athlete who exhibits signs, symptoms, or behaviors consistent with a concussion (such as unconsciousness, amnesia, headache, dizziness, confusion, or balance problems), either at rest or exertion, shall be immediately removed from practice or competition and shall not return to play until cleared by a physician or her/his designee. (b) Athletes who are rendered unconscious or have amnesia or persistent confusion shall not be permitted to continue

[385] Binney, Zachary O.; Bachynski, Kathleen E. 2018. "Estimating the prevalence at death of CTE neuropathology among professional football players." *Neurology*. DOI: 10.1212/WNL.0000000000006699 Accessed on January 6, 2019.
[386] One study, using a retrospective natural experiment design, of NFL players who participated in professional football from 1959 to 1988 and compared their outcomes to a similar sized sample of professional baseball players found significantly higher mortality rates from cardiovascular and neurodegenerative disease. See: Nguyen VT, Zafonte RD, Chen JT, et al. Mortality Among Professional American-Style Football Players and Professional American Baseball Players. *JAMA Netw Open.* 2019;2(5):e194223. doi:10.1001/jamanetworkopen.2019.4223
[387] NCAA. 2004. *2004-05 Sports Medicine Handbook*, p. 46.
[388] NCAA. 2013. *2013-14 Sports Medicine Handbook,* p. 7 and p. 64.

> for the remainder of the day. These athletes shall not return to any participation until cleared by a physician.[389]

This was language, practically verbatim, from the NCAA's 1933 medical handbook.

247. Evidence emerged immediately that there would be problems of compliance with the proposed rule. The day after the proposal an email sent to the members of the CSMAS stated that athletic trainers were already "expressing their displeasure over this recommendation."[390] One committee member asked: "Why are they complaining? If they are not already using these as guidelines, we are in trouble. If they are allowing athletes back in the game after losing consciousness, still suffering from amnesia, etc., we have a bigger problem than we thought."[391] The Player Rules Oversight Panel then rejected the rule. Ty Halpin (NCAA Association Director of Playing Rules Administration responded to Klossner: "This isn't about whether or not we agree with the proposal – it really is a great one and right on for football, for example. But putting it in each book as a hard/fast rule is problematic and has a much larger impact on all divisions."[392] Ultimately, the rule found its way into NCAA policy, although it seems clear that the organization did not intend to review those policies and ensure that they met an even respectable standard.[393] It was only after 2014 that the NCAA began enforcing basic medical standards, mandatory medical exams, and return-to-competition rules, and then only as a result of a class-action law suit.[394] As in its the past patterns, the NCAA only accepted a precautionary stance on student safety when litigation forced its hand.

248. Two final moments and somewhat recent in the history of the NCAA and its' approach to concussion and head injury encapsulate the dismaying facts and tragedies this report recounts. In 2010, Abe Frank, Managing Director of Government Relations, anticipated government pressure to support a federal bill on concussions, and asked in an email whether "the recommendations for youth sports would go beyond what is required at the college level?" The NCAA's David Klossner replied "Well since we don't currently require anything all steps are higher than ours."[395] Shortly later in the same year at a Concussion Summit, attended by representatives of the NCAA, in a moment of what appears to have been heated debate, an unknown minute taker wrote using capitalized letters: "Don't lose the perspective that IT'S a GAME."[396]

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[389] NCAA CSMAS Minutes, December 13-15, 2009, pp. 3-4.
[390] NCAA Email from Dean Crowell, December 16, 2009.
[391] NCAA Email from Charles R. Thompson, December 16, 2009.
[392] NCAA Email from Ty Halpin to David Klossner, January 14, 2010.
[393] NCAA, 2010. 2010-11 NCAA Sports Medicine Handbook, p. 55; also see NCAA Email from David Klossner to Mary Wilfert, 27 October 2011.
[394] MDL No. 2492. In re National Collegiate Athletic Association Student-Athlete Concussion Injury Litigation.
[395] NCAA Email from Abe Frank to David Klossner, February 23, 2010; NCAA Email from David Klossner to Abe Frank, February 23, 2010.
[396] NCAA. "Concussion Summit." 9 April 2010, p. 4.

XIII. CONCLUSION

249. On 17 March 2008, Dr Myles Brand, President of the NCAA from 2002 to 2009 spoke in an interview about health initiatives in the NCAA. He said:

> the health of our student-athletes is absolutely critical. In fact it's one of the main reasons why the NCAA was started over a hundred years ago to look after the well being and health of our student-athletes… So, I think, you can't put a price on a life of a young student-athlete. There's no question about that. But you always have the question in health care about how to allocate scarce resources, whether it is personnel costs or dollars and cents.[397]

250. The resources were not so scarce.[398] In 2013 the NCAA's Sports Medicine Handbook claimed that there was "controversy" concerning the long term consequences of repeat concussions in sports. It stated: "there is considerable controversy with regard to the long-term implications of concussion. On one end of the spectrum, some claim that repeated concussions cause a neurodegenerative brain disease called chronic traumatic encephalopathy or CTE. On the other end of the spectrum, some claim that there are no significant long-term sequelae of concussion. The murky evidence lies somewhere in between."[399] The statement reflects how far the NCAA had departed from what its mission required it to do. Compare that statement, for example, to what the NCAA said in its 1933 Medical Handbook, copyrighted by the NCAA. The Handbook candidly declared there to be a "general lack of appreciation by school and college authorities as well as by their medical advisors that there is in existence a considerable amount of medical knowledge that is of great value when properly applied to athletic training."[400] As to concussions, the Handbook stated: "There is definitely a condition described as "punch drunk" and often recurrent concussion cases in football and boxing demonstrate this."[401] In 1933, the course and existence of CTE and long term neurological disease caused by repeat concussions was not subject to "controversy." There was

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[397] See: Student Health and Well-Being | Myles Brand and download transcript at: https://mylesbrand.com/wp-content/uploads/2008/01/3-17-2008-Student-Athlete-Health.pdf, Accessed on 15 May 2021.

[398] By 2017 the NCAA generated a billion dollars in annual revenue. Scooby Axson, "NCAA Reports $1.1 Billion in Revenues: NCAA reports revenues of $1.1 billion in 2017." *Sports Illustrated*, 7 March 2018, https://www.si.com/college/2018/03/07/ncaa-1-billion-revenue Accessed 15 May 2021. Also see *National Collegiate Athletic Association and Subsidiaries: Consolidated Financial Statements as of and for the Years Ended August 31, 2017 and 2016, Supplementary Information for the Year Ended August 31, 2017, and Independent Auditors' Report.*

[399] NCAA. 2013. *2013-14 Sports Medicine Handbook,* p. 62. The claim is all the more remarkable because a year later the NCAA would learn from an actuarial study during litigation many college football players had CTE: In re National Collegiate Athletic Association Student-Athlete Concussion Injury Litigation Expert Report of Bruce Deal Regarding the Medical Monitoring Fund July 28, 2014.

[400] -- 1933. *National Collegiate Athletic Association Medical Handbook: Prevention and Care of Athletic Injuries, Recommendations for Medical Examination, Pre-Season Conditioning, Methods of Training, Diagnosis and Treatment of Injuries.* Princeton, NJ: Princeton University Press, p. 8.

[401] -- 1933. *National Collegiate Athletic Association Medical Handbook: Prevention and Care of Athletic Injuries, Recommendations for Medical Examination, Pre-Season Conditioning, Methods of Training, Diagnosis and Treatment of Injuries.* Princeton, NJ: Princeton University Press. p. 35.

no material or medical fact that prevented the NCAA from acting on its own knowledge to protect college football players from a long-term brain disease that would adversely change their lives and the lives of their families. Yet when Scott Anderson, Head Athletic Trainer at the University of Oklahoma, emailed Brian Hainline in 4 October 2016 and provided a chronology he fittingly dubbed in the subject line "protecting the game or the player?," Anderson noted that it was only in 2013 that targeting had become a point of emphasis. Anderson asked using bolded font: "My question is: "**From 2004 to 2016…from Reggie Brown to Carrington Thompsons…despite a decade's-old effort…what about helmet contact in the culture of college tackle football has changed?"**[402] Anderson apparently did not know that Ivan Williamson had attempted to do the same thing in 1963.[403]

251. The attitude of the NCAA shifted over the course of eighty years. In 1933, the NCAA employed great American doctors and provided precautionary and sound advice to protect college football players in real time, on the sidelines, with a concussion protocol that properly identified concussions as they happened and treated the player, which included not allowing him to return to play, possibly indefinitely. This was no different than the protocol employed and advocated by Harvard team physician Edward Nichols in 1906. The approach was echoed in the NCAA Official Boxing Rules in 1944.

252. But as college football became an ever larger and more profitable spectacle with larger stadiums, more numerous students and fans, and ever-increasing revenue from media and licensing contracts, the NCAA followed its economic interest, not its mission.[404] By the 1960s, the NCAA abandoned its mission entirely, including its duty to protect the health and safety of college football players from head injury and its latent effects. No matter what its top leadership said, the NCAA morphed from an organization that responded to and applied medical knowledge with the best interests of the students in mind, to one that barely acted on health and safety information at all, and only when forced by federal legislation or litigation.[405]

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[402] Email from Scott Anders to Brian Hainline; tberry@afca.com; Parsons, John, 3 October 2016. NCAA_Finnerty_0718842-0718843

[403] Ivan Williamson Memorandum, *circa* 1963, found within the David M. Nelson Papers.

[404][404] By 2017 the NCAA generated a billion dollars in annual revenue. Scooby Axson, "NCAA Reports $1.1 Billion in Revenues: NCAA reports revenues of $1.1 billion in 2017." *Sports Illustrated*, 7 March 2018, https://www.si.com/college/2018/03/07/ncaa-1-billion-revenue Accessed 15 May 2021. Also see *National Collegiate Athletic Association and Subsidiaries: Consolidated Financial Statements as of and for the Years Ended August 31, 2017 and 2016, Supplementary Information for the Year Ended August 31, 2017, and Independent Auditors' Report.*

[405] ESPN Senior Writer Peter Keating, 30 June, 2017, put the matter this way: "Maybe the best indication of the NCAA's priorities is simply this: Its chief medical officer has a staff of seven to address college-age health and safety issues from mental health to sexual assault. Meanwhile, its compliance desk has more than 50 employees who police amateurism among athletes. For all that, Brian Hainline, the chief medical officer of the NCAA, says he has "fire in his eyes" about concussions, and he emphasizes that brain trauma in sports is an issue "much bigger than football." Indeed, in a column on the NCAA's website, he wrote: "We need to spread the word: Yes, female athletes also suffer with concussion, and they may be uniquely predisposed to this neurological event." It's true that Hainline was close enough to Elliot Pellman, the notorious former chairman of the NFL concussions committee, for Pellman

253. The transformation was so complete that NCAA lawyers had the temerity to argue in court that the NCAA had no legal duty to protect students, a position its President admitted was a "terrible choice of words". The United States Senate described this statement as "extraordinary."[406] Neurologist Brian Hainline, the NCAA's first and, so far, only Chief Medical Officer, admitted that the NCAA had acknowledged to him its lack of concern for the health and safety of students who play varsity athletics. When describing his hiring in 2013, Dr. Hainline stated that the decision:

> came from their president, Dr. Emmert. He has been in that position for a couple of years, and he has been trying to return to the roots of the NCAA. When it was created in 1906, the NCAA was all about the health and safety of college athletes, especially college football players. There were many deaths. He saw that health and safety were really not first and foremost at the NCAA. He created this job, and I interviewed for it and had a good interview.[407]

254. Notwithstanding its mission, the NCAA divorced itself from the facts of brain injury in contact and collision sports, particularly college football, as if the vast medical knowledge compiled by the best physicians and researchers in America were an inconvenience best ignored.[408] That knowledge made vividly clear to the NCAA how important mandatory sideline concussion protocols were from 1906 onward. The NCAA's own measures in 1933 show how well the NCAA understood this. From 1906 to the present, decades of medical literature underscored the reality and severity of the latent neurodegenerative diseases that are caused by repeat concussive forces, recognized and unrecognized at the time they happen. These were always preventable with the right sideline protocols, which the NCAA had adopted in 1933.

255. Only litigation and legislation forced the NCAA to change (a fact that probably explains also why now its medical people (e.g. Brian Hainline) report to its lawyers (e.g. Donald Remy) in their National offices[409]). But the NCAA consistently delayed, obstructed, and resisted doing anything to address the long-term consequences of repeat concussions in football. It adopted a process that provided a veneer of steps to address the problem, but in fact evaded a solution and sought a coverup. In the area of helmet

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to blurb a book on back pain that Hainline published in 2007. And that in Hainline's early days on the job at the NCAA, it seemed as if he too might simply make excuses for how sports programs were treating athletes with brain injuries." https://www.espn.com/espnw/story/_/id/19775123/why-does-seem-cares-female-concussions Accessed on 17 May 2021.

[406] Committee on Commerce, Science and Transportation United States Senate. 2014, p. 60.

[407] Caplan, Arthur; Hainline, Brian. 2014. NCAA Physician: Concussion Danger in Sports Besides Football. https://www.medscape.com/viewarticle/825795 Accessed 31 July 2019.

[408] NCAA Board of Governors (BoG) SWOT Compilation Report, pp. 5 of 14 (NCAA_Finnerty_1396042) where it describes "cross-institutional (national) work on concussions" as a strength and notably describes another strength as the fact that the "NCAA provides education for presidents, athletic directors, and students." I have seen no record in any NCAA files or in NCAA testimony that notifies college presidents of any institution that their football programs have caused preventable long term neurodegenerative disease in former students. Without that kind of communication, public and private universities have not received from the NCAA the warning that lawsuits in the future can and will arise directly against them.

[409] Michael McCann, "Emmert, NCAA Officials Must Testify in CTE Case, Court Says," 4 May 2021. https://sports.yahoo.com/emmert-ncaa-officials-must-testify-205747844 html Accessed on 17 May 2021.

safety standards in the 1970s, the NCAA created a group (NOCSAE) the NCAA controlled for the purpose of creating standards that could be used by helmet manufacturers as a defense in litigation, which had grown substantially and threatened helmet manufacturers with bankruptcy. This result was that the NCAA took on a split identity steeped in irony. On one hand, the NCAA, through NOCSAE, set the agenda for safer sports equipment subject to NOCSAE testing and certification. On the other hand, NOCSAE certification requirements went without self-study. Helmets could never protect against concussive forces in football, because the brain moves in the skull in response to impact. No helmet, short of substantial padding on the outside, could mitigate or prevent that kinetic phenomenon. So the NOCSAE requirements were designed largely to set a standard helmet manufacturers could use to defend the product in litigation, not for the purpose of protecting college players from concussive forces. Nonetheless in 1972 the NCAA pronounced to its members that football helmets, even those not compliant with the NOCSAE standards not yet established, protected college players from most concussive forces in football.[410] This was false, yet G. Dennis Wilson, chair of the CSMAS from 1993 to 1997, later claimed that there was no better authority to set standards for equipment than the NCAA.[411] The irony is obvious. The NCAA was supposed to require compliance by member institutions regarding the safety of helmets about which the NCAA actively lied. Even as to the NOCSAE standards, the NCAA failed to enforce them.

256. When NCAA finally elected to revise its Medical Handbook in 1981, it failed to include a section on the management, treatment and prevention of concussive injury. The work of Nichols, Fauver, Thorndike, and Raycroft had completely disappeared. Yet at the same time, the NCAA asked students in a health questionnaire if they had experienced major injuries like cerebral concussion.

257. The Colorado Guidelines appeared in 1990; the NCAA made no effort to update their recommendations. It was not until 2009, after congressional scrutiny, that the NCAA was forced to re-visit the 1933 Medical Handbook. The NCAA, like the NFL, had been into the business of sowing doubt about the effects of concussions and even the existence of CTE. The approach begs the question: how problematic was it for the NCAA to explain to students, coaches and trainers that some leading doctors, as long ago as 1906 and 1933, thought that hits to the head in football led to preventable dementia or other neurodegenerative disease? Putting another way, there was never a medical "consensus" that said "do

[410] Compare, for instance, NCAA, "News Release: Football Helmet Safety Study Report," 10 May 1972 which says on pp. 1-2 "There is a wide difference in the performance of helmets, even among the same types, which indicates a need for standards that would eliminate unsafe helmets from the market" with what it said five days later in its definitive record, the NCAA News. See: NCAA, "NOCSAE Football Helmet Study Should Stimulate Safer Product," Vol 9, No. 7, 15 May 1972, see p. 6: "Current design of helmets has reached the point where the majority of them provide concussion protection up to levels which are rarely exceeded." See the quote from December 2013: "It should be noted that there is no helmet that can prevent a concussion." *NCAA Committee on Competitive Safeguards and Medical Aspects of Sports Position Statement* December 2013. See: https://www.ncaa.org/sites/default/files/Position+Statement.pdf accessed on 15 May 2021.

[411] Deposition of G. Dennis Wilson, March 31, 2016 in Mathew Onyshko v. NCAA, pp. 139-140.

nothing," and "say nothing," and "sow doubt about the existence of CTE." But that is precisely what the NCAA chose to do when faced with the serious health and safety issue.

258. The modern-day Hippocratic Oath enjoins doctors to say: "I will respect the hard-won scientific gains of those physicians in whose steps I walk, and gladly share such knowledge as is mine with those who are to follow," and also that "I will prevent disease whenever I can, for prevention is preferable to cure."[412] For generations doctors, scientists and engineers had described clearly without caveat the risks of concussive head injury. Carroll warned in 1936 that "[i]t is especially important that athletes entering into competitions in which head injuries are frequent and knock-outs are common should realize that they are exposing themselves not only to immediate injury, but also to remote and more sinister effects."[413] In 1952, Augustus Thorndike advised that athletes "with cerebral concussion that has recurred more than three times or with more than momentary loss of consciousness at any one time should not be exposed to further body-contact trauma. The college health authorities are conscious of the pathology of the 'punch-drunk' boxer."[414] Gronwall and Wrightson in 1975 said "doctors do have a duty to convince the controlling bodies and participants in sports where concussion is frequent that the effects are cumulative and that the acceptance of concussion injury, though gallant, may be very dangerous." [415] Robert Cantu wrote in 1996: "the late effects of repeated head trauma of concussive of even subconcussive force leads to the anatomical patterns of chronic brain injury with correlating signs and symptoms. Martland first introduced the term "punch drunk" (dementia pugilistica) in 1928. Although first described in boxers, "traumatic encephalopathy may occur in anyone subjected to repeated blows to the head from any cause." [416]

259. The NCAA was uniquely positioned to understand and address this health and safety issue. It had the knowledge, power, and self-evident responsibility to heed the medical warnings,[417] to implement protocols over time that mitigated and minimized the risks, and to enforce compliance with the protocols that developed and improved over time for the protection of the students who played football.[418] The NCAA did nothing.[419] In fact, throughout its history the NCAA evaded the issue and actively lied about the risks

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[412] "The Hippocratic Oath: Modern Version" https://www.pbs.org/wgbh/nova/doctors/oath_modern html Accessed 1-25-2019.
[413] Carroll, E. 1936. "Punch-Drunk." *American Journal of Medical Sciences.* 191. 5., p. 711.
[414] Thorndike, A. 1952. "Serious Recurrent Injuries of Athletes: Contraindications to Further Competitive Participation." *New England Journal of Medicine.* 247. 15., pp. 555-56.
[415] Gronwall, D D.; Wrightson, P. 1975. "Cumulative Effect of Concussion." *The Lancet.* 306. 7943., p. 997.
[416] Cantu, Robert. 1996. "Head injuries in sports." *British Journal of Sports Medicine* 30, p. 291.
[417] Deposition of David Klossner in the Matter of Arrington vs. NCAA, 16 April 2013, pp. 166-168
[418] So unconcerned has the NCAA been with health and safety that it appears that its own library has no medical journals as a regular part of its subscriptions and it has not archival subject headings dedicated to medicine or health. See Deposition of Ellen Louise Summers in the Matter of Ploetz v. NCAA, p. 61 and p. 195 respectively.
[419] Describing circumstances pointing to severe neglect of students, investigative reporter Nathan Fenno wrote after surveying a thousand communications that the reader could: "Start with the brutal email sent by a Division III football player named Rickey Hamilton Jr. to David Klossner, the NCAA's director of health and safety, in April 2008. Hamilton, who played for MacMurray College in Jacksonville, Ill., was concerned his team didn't have a

when it spread to its members the false notion that helmets, or for that matter mouthguards, protected college football players from concussive injury. The NCAA had lost track of the organization's purpose and the fact that football is a game. The NCAA's records show that it was foreseeable by the 1950s, and particularly with the universal use of the hard-shell plastic helmet in college football, that students would pay a steep price for the NCAA's decision to do nothing and actively lie about helmets and mouthguards. By 2010 David Klossner, the NCAA's Director of Health and Safety said in an email regarding concussion safety in NCAA sports: "Well since we don't currently require anything all steps are higher than ours."[420] In that same year, when the NCAA's Health and Safety Group drafted a single page concussion fact sheet, editors deleted sentences that warned students that a concussion is a brain injury that "can end your season, impact your GPA, and have long term life consequences,"[421] and "is serious even if you've just been "dinged" or had your "bell rung," and "cannot be "walked off," "shaken out," taped, or bandaged."[422] This appears to be a well thought out plan by the NCAA *not* to warn students about the risks of concussive injury in college sports.

260. In recent years publications have focused on small matters of uncertainty regarding the nature of repeat concussive brain injury and the long-term latent effects that result in neurodegenerative disease. The matters are both small and irrelevant. The NCAA had a unique level of knowledge, responsibility, and power to address concussive injury in football in 1906, and the NCAA made it quite clear what needed to happen at the convention in 1932 and with the 1933 Medical Handbook. This has always been about precautionary measures required to identify, mitigate and treat these injuries, even to prevent them before they happen. The NCAA was the responsible authority for this purpose. It did not need in 1933 decades-long observational studies and statistical associations between recurrent head impacts and lasting neurocognitive effects to address the risks the NCAA knew college football players were taking. In the 1930s and 1940s, the NCAA was fully aware of the risks to students (see the 1933 medical handbook and the 1944 NCAA boxing guide). The evidence continued to mount, unabated. In 2018 the Centers for

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trainer at practices or most games. "There are multiple players on my team who have suffered injuries and have not had the correct treatment for them," Hamilton wrote. "We are trying to see what we can do about this because this is not fair to the student athletes who put their all into something and can't even get the proper treatment needed." A week later, Klossner responded that the NCAA didn't have rules relating to the use of athletic trainers and, ironically, linked concussion awareness videos from the National Athletic Trainers' Association. Translation: This wasn't the NCAA's problem." See Nathan Fenno "NCAA's concussion culture rooted in denial" Washington Times, 22 July 2013:
https://www.washingtontimes.com/news/2013/jul/22/ncaa-concussion-culture-rooted-denial/ Accessed 15 May 2021.

[420] NCAA Email from Abe Frank to David Klossner, February 23, 2010; NCAA Email from David Klossner to Abe Frank, February 23, 2010.

[421] There was a straight line back to the Carnegie Report indicating the reality of this concern. See Savage, H. J.; Bentley, H. W.; McGovern, J. T.; Smiley, D. F. 1929. *American College Athletics.* Boston. The Merrymount Press.

[422] See NCAA 2010. *Proof: Concussion a Fact Sheet for Student-Athletes*. Cf. with NCAA. 2013. *Concussion: A Fact Sheet for Student Athletes.*

Disease Control published a flyer for its Heads Up Safe Brain Stronger Future Campaign entitled "Answering questions about Chronic Traumatic Encephalopathy (CTE)."[423] Despite this evidence, University of North Carolina Head Football Coach Larry Fedora, and member of the FRC, stated in 2019 that "I don't think that the game of football, or [that] it's been proven that the game of football causes CTE, but that's been put out there. We don't really know yet."[424] Months earlier, Brian Hainline, Chief Medical Officer of the NCAA and board-certified neurologist, testified under oath that he had informed "every single school in the country" that there is "emerging literature, very emerging, suggests that there may be an association between repetitive head impact exposure, or concussions, and long-term neurological consequences" and he recounted [425] These divergent opinions show the conflict within the NCAA itself.

261. A recent 2019 meta-analysis by Zhang and colleagues shows there is no controversy and never was one. Using rigorous inclusion criteria, including the need for physician diagnosis of concussion and requiring neurocognitive assessments to have occurred ten years after retirement from sports, Zhang and colleagues found major deficits in verbal memory, delayed recall, and attention among former players.[426] Similarly a Scottish team of clinicians recently explored neurocognitive outcomes in soccer players, using 7676 former professional soccer players and comparing them with 23,028 controls. The research team found substantially elevated risks of mortality with and from neurodegenerative disease.[427] Consensus criteria for neuropathological evaluation of CTE have emerged and been refined.[428] Other researchers have shown molecular consistency across two sports.[429] Against these positive findings, important negative ones have also come to light. A recent study shows that the pathology of chronic traumatic encephalopathy is absent from a normal European brain bank population of 310 brains, offering

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[423] CDC, *Answering Questions about Chronic Traumatic Encephalopathy (CTE)*, 2018.
[424] Quoted in Aaron Gordon, "Larry Fedora's Football Crusade is About Culture War, Not Science," *Deadspin* 23 July 2018 https://deadspin.com/larry-fedoras-football-crusade-is-about-culture-war-no-1827805658, accessed on 15 May 2021. See also NCAA "Committee Selection Links: A JSP Application Football Rules Committee" marked Bates Ploetz.Plt.019980.
[425] Debra Ploetz vs. National Collegiate Athletic Association in the District Court Dallas County Texas, 15 June 2018, lines 14-25 and line 5.
[426] Zhang, Yanjie, Yongzhi Ma, Shihui Chen, Xiaolei Liu, Hye Jung Kang, Siera Nelson, and Samantha Bell. "Long-term cognitive performance of retired athletes with sport-related concussion: a systematic review and meta-analysis." *Brain sciences* 9, no. 8 (2019): 199.
[427] Mackay, Daniel F., Emma R. Russell, Katy Stewart, John A. MacLean, Jill P. Pell, and William Stewart. "Neurodegenerative disease mortality among former professional soccer players." *New England Journal of Medicine* 381, no. 19 (2019): 1801-1808.
[428] McKee, Ann C., Nigel J. Cairns, Dennis W. Dickson, Rebecca D. Folkerth, C. Dirk Keene, Irene Litvan, Daniel P. Perl et al. "The first NINDS/NIBIB consensus meeting to define neuropathological criteria for the diagnosis of chronic traumatic encephalopathy." *Acta neuropathologica* 131, no. 1 (2016): 75-86; Bieniek, Kevin F., Nigel J. Cairns, John F. Crary, Dennis W. Dickson, Rebecca D. Folkerth, C. Dirk Keene, Irene Litvan et al. "The second NINDS/NIBIB consensus meeting to define neuropathological criteria for the diagnosis of chronic traumatic encephalopathy." *Journal of Neuropathology & Experimental Neurology* 80, no. 3 (2021): 210-219.
[429] Falcon, Benjamin, Jasenko Zivanov, Wenjuan Zhang, Alexey G. Murzin, Holly J. Garringer, Ruben Vidal, R. Anthony Crowther et al. "Novel tau filament fold in chronic traumatic encephalopathy encloses hydrophobic molecules." *Nature* 568, no. 7752 (2019): 420-423.

yet further evidence that exposure to repetitive hits to the head is fundamentally the cause of neurodegenerative pathologies.[430]

262. Much of the NCAA's response to the coronavirus pandemic of 2020 and 2021 stands in sharp relief to its passivity and active prevarication regarding head impact trauma. Despite decades of awareness about the problems of head impact trauma, the NCAA has been a naysayer on the risks of recurrent injuries even as an actuary report produced in litigation against them, according to Senator Chris Murphy of Connecticut, makes clear that the NCAA is aware that approximately sixteen thousand former American college football players who had played from 1956 to 2008 may suffer from impact related neuro degenerative diseases.[431] Contrast this fact with the NCAA's response to the coronavirus pandemic. By March of 2020 the NCAA had cancelled all Division I men's and women's basketball tournaments and all other winter and spring championships to slow the spread of the virus. The NCAA effected the decision effortlessly. Repetitive head impacts in college football still awaits a similar aggressive response.[432]

263. This report shows that there is substantial and convincing evidence in the historical record that the NCAA was positioned like no other organization ever to study and understand the adverse consequences of repeat head impacts in college sports, particularly college football. For decades, the NCAA was aware that college football fields were a living laboratory to understand repeat concussive injury and the measures the NCAA should take to identify, mitigate and treat that injury. The NCAA did nothing to help this situation. In fact, the evidence shows that the NCAA aggravated the risk by misleading its own member institutions (and, therefore, the students the NCAA was supposed to protect) to the false idea that helmets and mouthguards protected the students against concussive injury in football. Consistent with that approach, the NCAA never warned any student or parent that exposure to repeat head impacts in football and other sports should be avoided and could lead to life-altering neurological diseases. The NCAA never did anything at all to implement and enforce a concussion protocol of any kind, including the protocol in the NCAA's own 1933 Medical Handbook.

264. Finally, to a reasonable degree of scientific certainty and historical rigor, all sports organizations, including the NCAA, the NFL and other professional and amateur football leagues, knew for generations that the sport of football exposed players, including children, to cumulative exposure to

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[430] Forrest, Shelley L., Jillian J. Kril, Stephanie Wagner, Selma Hönigschnabl, Angelika Reiner, Peter Fischer, and Gabor G. Kovacs. "Chronic traumatic encephalopathy (CTE) is absent from a European community-based aging cohort while cortical aging-related tau astrogliopathy (ARTAG) is highly prevalent." *Journal of Neuropathology & Experimental Neurology* 78, no. 5 (2019): 398-405.

[431] Chris Murphy, "Madness, Inc. How College Sports Can Leave Athletes Broken and Abandoned" (2019) https://www.murphy.senate.gov/download/madness-inc-3, PDF, p. 13; see the expert report: In re National Collegiate Athletic Association Student-Athlete Concussion Injury Litigation Expert Report of Bruce Deal Regarding the Medical Monitoring Fund July 28, 2014.

[432] See, for example, Email from Terri Gronau to Jackie Campbell et al, 2 March 2018, which discusses the concussion management plan and notably seems to include only NCAA officials. NCAA_Finnerty_1398910

subconcussive and concussive blows that are proven to lead neurological disease, disability and death. These facts apply well to the NCAA whose founding mission was to protect the health and safety of college students who played football. These amateur athletes had every reason to believe, based on the NCAA's own assertions throughout its history, that "student-athletes rightfully assume that those who are responsible for the conduct of sport have taken reasonable precautions to minimize the risk of significant injury."[433] As a football coach put it in *NCAA News* 1972: "Nothing is more important in handling your college athletes than being truthful with them…accept each youth as an individual with whom you must communicate honestly and intelligently."[434] As a stakeholder put the matter in 2018: "We have to be honest."[435] The NCAA failed that basic test of truthfulness. Students have paid a steep price, and they continue to pay it despite seemingly having no time to know it themselves.[436]

265. I reserve the right to amend my report and opinions as additional information becomes available. I am aware that thousands of additional documents remain to be produced, as well as that there are upcoming depositions of numerous current and former NCAA employees in this, the *Geathers v. NCAA* case, as well as in cases throughout the country. I also understand that there are thousands of NCAA documents that have been misplaced, destroyed, or are otherwise unavailable. Upon receipt of these documents and transcripts I will supplement my report as appropriate.

electonically signed 12/21/2021

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[433] NCAA, 1994. *1994-95 NCAA Sports Medicine Handbook*, p. 4; David Klossner echoed these remarks in congressional testimony. He said: "Participation in intercollegiate athletics involves unavoidable exposure to inherent risk of injury. However, student-athletes rightfully assume that those who sponsor intercollegiate athletics have taken reasonable precautions to minimize the risks of injury from athletics participations. The NCAA's health and safety recommendations and policies are addressed through the collaborative efforts of national office staff, governance committees, sport playing rules committees, sport issues committees, and external associations." Statement of David Klossner, January 4, 2010. "Legal Issues Relating to Football Head Injuries (Part I & II). *Hearings Before the Committee on the Judiciary House of Representatives One Hundred Eleventh Congress, First and Second Sessions October 28, 2009 and January 4, 2010*, p. 288. He also clarified that "our guidelines apply to all student athletes the same." p. 364.

[434] Quoted in Searcy, Jay. 1972. "Columnary Craft." *NCAA News* 9. 3., p.2.

[435] *NCAA Strategic Planning Initiative Stakeholder Analysis Summary Report* in 2018. The full quote is: "We have to be honest. We have be honest in our advocacy for college sports. And with all this money involved, people can be pulled away from this." NCAA_Finnerty_1396007

[436] "For example, Northwestern maintains daily itineraries regulating players' hourly tasks from the time they wake up until the appointed hour that they go to sleep…." R. Griffin, Memo GC 17-01, *General Counsel's Report on the Statutory Rights of University Faculty and Students in the Unfair Labor Practice Context* 31 January 2017, pp. 19-20.

EXHIBIT A

MATERIALS USED TO FORMULATE MY OPINIONS

MATERIALS USED TO FORMULATE MY OPINIONS

In addition to primary and secondary sources cited in the report above, please find below a list of documents used in formulating the opinions expressed in this report.

Libraries

American Archive of Public Broadcasting (online)
British Library
Clarkson University Libraries
Countway Library, Harvard Medical School
Royal College of Physicians London
Wellcome Library for the History of Medicine
Whipple Library, Cambridge University
Widener Library, Harvard University

Selected Individual Documents Regarding Robert Geathers

Robert and Debra Geathers vs. National Collegiate Athletic Association.

Selected Collections Provided by Plaintiff's Council[437]

Annual Reports of the NCAA
David M. Nelson Papers
Depositions in Arrington
Depositions in Ploetz
Depositions in Onyshko
Documents produced in Arrington
Documents produced in Geathers and Hamlin
Documents produced in Finnerty
Documents produced in Ploetz
Documents attached to depositions taken in Ploetz
Documents attached to depositions taken in Onyshko
NCAA Boxing Rules Committee, 1939-1961
NCAA News, 1972-1985
NCAA Proceedings, 1906-2005
NCAA CSMAS Minutes and Internal Documents, 1968-2010
NCAA Division I Manuals
NCAA Division II Manuals
NCAA Executive Committee Minutes, 1966-1973
NCAA Football Rules Committee
NCAA Football Rules and Interpretations
NCAA Sports Medicine Handbooks, 1933, 1981, 1983, 1987, 1992-93, 1993-94, 1994-95, 1995-96, 1996-97, 1998-99, 1999-00, 2000-01, 2002-03, 2004-05, 2006-07, 2013-14, 2014-15.
NOCSAE, Minutes and Internal Papers, 1970-1989
Trial exhibits in Ploetz
Trial exhibits in Onyshko

[437] Note that the dates indicate the range of the collections. I am unable to say whether the collections are complete.

Selected Collections Relied Upon in my Research

David M. Nelson Papers, University of Delaware

National Commission on Product Safety: Football Helmets and Head Injuries

Selected papers listed in Jack C. Hughston, M.D., and Kenneth S. Clarke, *A Bibliography of Sports Medicine* (American Academy of Academy of Orthopedic Surgeons, 1970)

Wayne State University Papers

- *Biographical collection of Voigt R. Hodgson*
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EXHIBIT B

CURRICULUM VITAE

Curriculum Vitae

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HISTORY OF ACADEMIC APPOINTMENTS

2018-2021	Associate Director, Clarkson Honors Program
2018-present	Professor, Humanities & Social Sciences, Clarkson University
2014-2018	Associate Professor, Humanities & Social Sciences, Clarkson University
2015	Visiting Scholar, Department of History and Philosophy of Science, Cambridge University
2010-2014	Assistant Professor, Humanities & Social Sciences, Clarkson University
2007-2010	Visiting Assistant Professor, Humanities & Social Sciences, Clarkson University
2007	Scholar-in-Residence, Rockefeller Archive Center, Sleepy Hollow, NY

SCHOLARSHIP

Books

Casper, ST. (2014). *The Neurologists: A History of a Medical Specialty in Modern Britain, c. 1789-2000*. Manchester: Manchester University Press

Edited Books

Casper ST. and Gavrus G. (2017), eds. *The History of the Brain and Mind Sciences: Technique, Technology and Therapy*. Rochester NY: University of Rochester Press.

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Journal Articles

Casper, ST. (Forthcoming). "The Anecdotal Patient: Brain Injury and the Magnitude of Harm." *Notes and Records of the Royal Society Journal of the History of Science*.

Casper, ST. (Forthcoming). "Punch Drunk Slugnuts: Violence and the Vernacular History of Disease" *Isis*.

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Casper, ST. (2021). "The Intertwined History of Malingering and Brain Injury: An Argument for Structural Competency in Traumatic Brain Injury." *Journal of Law, Medicine, and Ethics* 49 (3), 365-371.

Casper, ST. (2020 [2019 Dec. Online]). "The Punch-Drunk Boxer and the Battered Wife: Gender and Brain Injury Research." *Social Studies & Medicine*. 245, 112688.

Casper, ST. (2018). "A History of the Locked-in-Syndrome: Ethics in the making of neurological consciousness, 1880-Present." *Neuroethics*. https://doi.org/10.1007/s12152-018-9374-7

Casper, ST. (2018). "Concussion: A History of Science and Medicine, 1870-2005." *Headache*: *The Journal of Head and Face Pain.* 58(6): 795-810 DOI: 10.1111/head.13288

Casper, ST. (2018). "How the 1950s changed our understanding of traumatic encephalopathy and its sequelae." *Canadian Medical Association Journal*. 190(5): E140-142.

Casper, ST. (2016). “The Currency of Consciousness: Neurology, Specialization, and the Global Practices of Medicine” *Canadian Bulletin of Medical History* 33(2), pp. 321-363.

Casper, ST. (2016). “Inexplicable Patients: Charles Martell and the Patients of Ward 4 at the Massachusetts General Hospital” *Canadian Medical Association Journal* 188, pp. 1263-1264.

Casper, ST., Welsh, R. (2015). “British Romantic Generalism in the Age of Specialism, 1870–1990.” *Social History of Medicine*, 29(1), pp. 1-21.

Casper, ST. (2015). “Of means and ends: Mind and Brain Science in the Twentieth Century.” *Science in Context* 28(1), pp. 1-7.

Casper, ST. and Schilling, R. (2015). “Of Psychometric Means: Starke R. Hathaway and the Popularization of the Minnesota Multiphasic Personality Inventory.” *Science in Context 28*(1), pp. 77-98.

Casper, ST. (2014). “An Integrative Legacy: History and Neuroscience.” *Isis*, Focus *105*(1), pp. 123-132.

Casper, ST. (2011). “One Hundred Members of the Association of British Neurologists, A Collective Biography, 1933-1960.” *Journal of the History of Neuroscience, 20*(4), pp. 338-356.

Casper, ST. (2010). “‘In Consequence of Enemy Action’: British Medical Students in North American Medical Schools, 1939-1945.” *British Medical Journal,* 341(c7041), pp. 1336-1338.

Casper, ST. (2010). “Trust, Protocol, Gender, and Power in Interwar British Biomedical Research: Kathleen Chevassut and the ‘Germ’ of Multiple Sclerosis.” *Journal of the History of Medicine and Allied Sciences*, vol. 66(2), pp. 180-215.

Casper, ST. (2008). “Conjunctures in Anglo-American Neurology: Lewis H. Weed and Johns Hopkins Neurology, 1917-1942.” *Bulletin of the History of Medicine,* vol. 82, pp. 646-671.

Casper, ST. (2008). “The Origins of the Anglo-American Research Alliance and the Incidence of Civilian Neuroses in Second World War Britain.” *Medical History,* vol. 52, pp. 327-347.

Edited Special Issue Journals

Casper, ST. ed. (2015), "Of Means and Ends in the Mind and Brain Sciences" *Science in Context 28*(1), volume pp.1-170.

Essays and Commentaries

Kalman-Lamb, N; Smith, J.; Casper, ST (2021) "Student Athlete Has Always Been a Lie: The NCAA coined the term in the 1950s to deny basic rights to students." December 6th, https://www.chronicle.com/article/student-athlete-has-always-been-a-lie.

Casper, ST. (2021). "Don't Feel Guilty For Loving Football". *Public Seminar* Week of October 4th, https://publicseminar.org/essays/dont-feel-guilty-for-loving-football/.

Casper, ST. (2019). "With Hindsight, I See That I Was Right" John C. Burnham's Final Words, as Recounted by a Trickster." *Isis* 110(4), 792-795.

Casper, ST. (2018). "Eloge: John C. Burnham, 1929-2017" *Isis* 109(1): pp.140-142.

Casper, ST. (2018). "Reductionism in Epigenetics." In S. Fuller ed. "Symposium on Maurizo Meloni's *Political Biology*." *History of the Human Sciences* 31(1), 132-135. https://doi.org/10.1177/0952695117729119

Casper, ST. (2014). "Chickens and Eggs. A Commentary on Chris Renwick's: 'Completing the Circle of the Social Sciences? William Beveridge and Social Biology at London School of Economics in the 1930s." *Philosophy of the Social Sciences* 44(4), pp. 506-514.

Casper, ST., Espinosa, M. (2012). "Introducing the new Media Reviews section." *Medical History* 56(4), pp. 615.

Casper, ST. (2007). "'Then why not an Association of British Neurologists?'" British Neurologists and the Founding of an Elite Medical Society." *Advances in Clinical Neuroscience and Rehabilitation*, pp. 2-3.

Casper, ST. (2006). "The Association of British Neurologists, 1930-1965." *Wellcome History*. vol. 31, pp. 9-10.

Casper, ST. (2005). "British Neurology, 1920-1960: A Neurologist's Labours." *World Neurology*. vol. 20, p. 12.

Book Chapters

Casper, ST., Winter, R. (2021). "Mind/Brain: A Tentative Cultural History." In Jonathan Reinarz (ed), *The Cultural History of Medicine, 1800-1920*, London: Bloomsbury Place.

Casper, ST., Gavrus, D. (2017). *Introduction.* In Stephen T Casper and Delia Gavrus (eds), *The History of the Brain and Mind Sciences: Technique, Technology, and Therapy*. Rochester, NY: University of Rochester Press.

Casper, ST (2017). "Dualist Techniques for Materialist Imaginaries: Matter and Mind in the 1951 Festival of Britain." In Stephen T Casper and Delia Gavrus (eds), *The History of the Brain and Mind Sciences: Technique, Technology, and Therapy*. Rochester, NY: University of Rochester Press.

Casper, ST., (2016). "*The Political* without Guarantees: Neuroscientific Cultural Imaginaries and Neuroscientific Futures." In Lorenzo Servitje and Kari Nixon (eds), *Endemic: Essays in Contagion Theory*, London: Palgrave MacMillan, pp. 169-190.

Casper, ST., Jacyna, L. S. (2012). *Introduction* (pp. 1-20). In L. Stephen Jacyna and Stephen T. Casper (eds.), *The Neurological Patient in History,* Rochester NY: Rochester University Press.

Casper, ST. (2012). "The Patient's Pitch: The Neurologist, the Tuning Fork, and Textbook Knowledge." In L. Stephen Jacyna and Stephen T. Casper (eds.), *The Neurological Patient in History,* Rochester NY: Rochester University Press, pp. 21-43.

Book Reviews and Essay Reviews

Casper, ST (2021). "Envisioning the Emotive Mind" *Science* 372(6549): 1401.

Casper, ST. (2021). "Alan Ropper and Brian D. Burrell. How the Brain Lost Its Mind: Sex, Hysteria, and the Riddle of Mental Illnesses." *Journal of the History of the Behavioral Sciences* 57(3): 305-307.

Casper, ST. (2020). "Lee Vinsel. Moving Violations: Automobiles, Experts, and Regulations in the United States" *Journal of the History of Medicine and Allied Sciences* 75(3): 358-360.

Casper, ST. (2020). "Katherine Foxhall, Migraine: A History." *American Historical Review* 125(3): 995-996.

Casper, ST. (2020), "Matthew Cobb, The Idea of the Brain: A history." *Nature* 580(7801): 23-24.

Casper, ST. (2019), The history and future of neurological care. *Science* 364 (6437): 243-244.

Casper, ST. (2018), Essay Review: "Victoria Pitts-Taylor. The Brain's Body: Neuroscience and Corporeal Politics; Tobias Rees. Plastic Reason: An Anthropology of

Brain Science in Embryogenetic Terms; Fernando Vidal and Francisco Ortega. Being Brains: Making the Cerebral Subject." *Journal of the History of Medicine and Allied Sciences* 73(4): 501-506.

Casper, ST. (2018), "Neurodiversity, in profile." *Science* 361(6401): 456-457.

Casper, ST. (2018). "Rebel Genius: Warren S. McCulloch's Transdisciplinary Life in Science." *Medical History*. 62(01): 132-133

Casper, ST. (2017). "The Wounded Brain Healed: The Golden Age of the Montreal Neurological Institute, 1934-1984." *Social History of Medicine*. 30(4): 843-844.

Casper, ST. (2016). "Andrew Scull, Madness in Civilization: A Cultural History of Insanity, from the Bible to Freud; from the Madhouse to Modern Medicine." *Isis* 107(2): 608-609.

Casper, ST. (2016). "Worlds of ScienceCraft: New Horizons in Sociology, Philosophy, and Science Studies." *Contemporary Sociology: A Journal of Reviews*. 45(2), pp. 228-229.

Casper, ST. (2015). Reviews: "American Lobotomy: A Rhetorical History." *Literature & History. 24*(2), pp. 119-120.

Casper, ST. (2015). "Nicolas Langlitz, Neuropsychedelia: The Revival of Hallucinogen Research Since the Decade of the Brain." *Social Studies of Science.* DOI: 10.1177/0306312715598398

Casper, ST, (2015), "Ivan Pavlov Revealed" *Science. 347(6229)*, p.1425.

Casper, ST. (2015), "Nikolas Rose and Joelle Abi-Rached, Neuro: The New Brain Sciences and the Management of the Mind," *Journal of the History of Behavioral Sciences.* 51(1), pp. 95-98.

Casper ST. (2014) "Gabriel Finkelstein, Emil du Bois-Reymond: Neuroscience, Self, and Society in Nineteenth-Century Germany." *Metascience* 24(1), 85.

Casper, ST. (2013). "James Kennaway, Bad Vibrations: The History of the Idea of Music as a Cause of Disease." *Social History of Medicine* 26(3), 590-591.

Casper, ST. (2013). "West Riding Lunatic Asylum and Brain Science." Dissertation Reviews. http://dissertationreviews.org/archives/4528.

Casper, ST. (2013). "Brown-Séquard: An Improbable Genius Who Transformed Medicine." *Journal of the History of Medicine and Allied Sciences.* 68(3): pp. 488-490.

Casper, ST. (2012). “International Relations in Psychiatry: Britain, Germany, and the United States to World War II.” *Medical History.* 56(3), pp. 405-406.

Casper, ST. (2012). “Neurosurgery at Washington University: A Century of Excellence.” Journal of the History of Medicine and Allied Sciences 64(4), pp. 666-667.

Casper, ST. (2012). “The Origins of Autism Research.” Dissertation Reviews. http://dissertationreviews.org/archives/813

Casper, ST. (2011). “The Cure Within: A History of Mind-Body Medicine.” *Medical History.* 55(1), pp. 133-134.

Casper, ST. (2011). “Smallpox: The Death of a Disease.” *Journal of the History of Medicine and Allied Sciences.*66(2), pp. 276-277.

Casper, ST. (2011). “The Collectors of Lost Souls: Turning Kuru Scientists into Whitemen; The Social Construction of Disease: From Scrapie to Prion.” *Journal of the History of the Neurosciences* 20(1), pp. 160-169.

Casper, ST. (2010). “Hysteria: The Biography.” *Social History of Medicine* 23(3), pp. 692.

Casper, ST. (2010). “The Evolutionary Epidemiology of Mania and Depression: A Theoretical and Empirical Interpretation of Mood Disorders.” *Medical History.* 54(2), pp. 283-284.

Casper, ST. (2010). “A Revisionist History of American Neurology.” *Brain* 133(2), pp. 638-642.

Casper, ST. (2009). “Brain, Mind, and Medicine: Essays in Eighteenth Century Neuroscience.” *History of Psychiatry.* 20(1), pp. 111-114.

Casper, ST. (2009). “On Deep History and the Brain.” *Medical History.* 53(2), pp. 318-319.

Casper, ST. (2007). “Harvey Cushing: A Life in Surgery.” *Medical History* 51(3), pp. 424-425.

Correspondence

Casper, ST, (2020) “Including second impact syndrome in sports-related concussions evidence review.” Jama Pediatrics. Online.

Casper, ST; Golden, J; Oreskes, N; Largent, M; Goldberg, D.S. et al (2019) “First Report the Findings: Genuine Balance When Reporting CTE” *Lancet Neurology* 18(6), pp. 522-523.

Blogs and Online Publications

Miscellaneous publications at "The Neuro Times," www.dictionaryofneurology.com.

CURRENT PROJECTS

Work-in-Progress Book:	*Punch Drunk and Dementia: A Modern History of Concussion, 1870-2012*
Work-in-Progress Edited Book:	*Troubling Encounters in the History of the Human Sciences: Latin America and the United States Empire, 1870s-2000s* (edited with Adam Warren and Julia Rodriguez)

LITIGATION AND MEDIA

Depositions

Deposed in the matter of *Kimberly Archie et al. v. Pop Warner Little Scholars*.

Deposed in the matter of *National Hockey League Players' Concussion Injury Litigation*, MDL, 14-2551 SJN.

Media Appearances

Casper, ST (2021). "Chronic Traumatic Encephalopathy Isn't New" Blog of the *Los Angeles Review of Books* http://blog.lareviewofbooks.org/essays/chronic-traumatic-encephalopathy-isnt-new/.

Casper, S. "A Player With Shoulder Pain, and a League Happy to Turn Its Back." *New York Times* (October 26, 2019).

Casper, S and Tatos, Ted (August 27, 2019) "Using College Athletes as Concussion Test Subjects Makes Nobody Safer." *The American Prospect*. https://prospect.org/culture/using-college-athletes-concussion-test-subjects-makes-nobody-safer/

Casper, S. "Just one season of playing football – even without a concussion – can cause brain damage." Science Magazine (August 7, 2019).

Casper, S "The N.F.L. Has Been Consumed by the Concussion Issue. Why Hasn't the N.H.L.?" *New York Times* (May 31, 2019).

Casper, S (2018) “An Historical Look at Brain Injuries, CTE and the NFL.” Razed Sports.

Casper, S. (2018) “Brain injury: scientific records from 1918–1950 align with current knowledge of concussion and CTE.” CMAJ Podcasts. https://soundcloud.com/cmajpodcasts/171204-medsoc

Casper, S “Why we still don’t understand sleep, and why it matters.” *Independent* (October 26, 2017).

AWARDS AND HONORS

2018	Kristin Craig Memorial Faculty Recognition Award, Clarkson Honors Program.
2018	The Clarkson Excellence in Research and Scholarship Award, Clarkson University (awarded to one faculty member each year).
2014	John W. Graham Faculty Research Award, Clarkson University (awarded to one faculty member each year at the time of tenure and promotion).
2012	RESPECT, Accommodative Services, Clarkson University (an award for disability advocacy).
2011	Commendable Leadership Award, PHALANX. (Clarkson’s University highest honor for service to the university as deemed by students)
2010	CUSA Teaching Award, Clarkson University Student Association
2009	Outstanding Young Teacher Award, Clarkson University
2006	Roy Porter Travel Prize, Wellcome Trust Centre for the History of Medicine

GRANTS

2020	Clarkson University Grant for Undergraduate REUs in the History of Medicine. $4,475.00.
2019	Dunfey Center Conference for “Locating 'the Human' in the Human Sciences: Encounters, Affect, and Ethics in the Americas, 1800 to the Present.” At the University of New Hampshire. Applicants: Julia E. Rodriguez (UNH); Adam Warren (University of Washington); Stephen Casper (Clarkson University). $32,000.00.

2012 Center for Canadian Studies, Clarkson University (Principal). Canadian and American Conference on Mind and Brain Sciences. (January 15, 2012 - May 6, 2012). $2,000.00.

2011 National Endowment for the Humanities (Principal). Islamic Science: Summer Seminar. SUNY, Potsdam. (June 1, 2011 - July 15, 2011). $3,000.00.

2010 New York Council for the Humanities (Co-Principal). Mini Grant for War, Disability & Society. (April 2010 - August 2010). $1,500.00

2010 Center for Canadian Studies, Clarkson University (Principal). Small Research Grant. (May 2010 - June 2010). $750.00

2008 National Endowment for the Humanities (Principal). Art, Labor, and Working Class Culture: Summer Seminar. SUNY, Potsdam. $3,000.00. (June 1, 2008 - July 15, 2008). $3,000.00

2008 Bakken Library (Principal). “Neurology and Electricity.” Travel grant. (May 1, 2008 - May 14, 2008). $500.00

2007 Rockefeller Foundation Archive Center Fellowship. “Transnational Liaisons in Interwar and Postwar Anglo-American Physiology.” (May 1, 2007 - July 30, 2007). $10,000.00

2003-2006 Association of British Neurologists. PhD Studentship. (August 2003 - August 2006). $42,000.00

2003-2006 Wellcome Trust Centre for the History of Medicine. PhD Studentship. (August 2003 - August 2006). $42,000.00

2005 Rockefeller Foundation Archive Center Fellowship. "Neurology in Britain," Travel grant. (June 2005 - July 2005). $1,750.00

EDITORIAL ROLES

2019-Present Editorial Board, *Medical History*
2012-2014 Media Reviews Editor for *Medical History*

INVITED PRESENTATIONS

2021 “Punch Drunk Slugnuts: Violence and the Vernacular History of Disease,” University of Minnesota, History of Science, Medicine, and Technology Colloquium (10 September 2021).

2021 "Stigma and Concussive Injury," Concussion Alliance, Zoom, Washington, Seattle (20 July 2021).

2021 "Punch Drunk Slugnuts: Violence and the Vernacular History of Disease," Current Topics in TBI. Spinal Cord and Brain Injury Research Center, University of Kentucky, USA (7 July 2021).

2021 "Punch Drunk Slugnuts: Violence and the Vernacular History of Disease," The Waring Lecture, Zoom Lecture, Waring Historical Library, Charleston, South Carolina, USA (11 March 2021).

2021 "Battered Wives vs. Battered Boxers". Casual Conversation, PINK Concussion, Zoom, USA (January 14, 2021).

2020 "The Idea of the Brain: Interview with Matthew Cobb" Zoom Interview for Café Culture, Newcastle-upon-Tyne, UK (September 1, 2020).

2020 "Small Pox in Global Perspective" Zoom Lecture St. Lawrence University (April 14, 2020).

2020 "Punch Drunk Slugnuts: Violence and the Vernacular History of Disease" Beaumont Club Lecture, Yale University (Friday 21, 2020).

2020 "Litigation as an Historian: Brain Injury and Society." Zoom Lecture Lehigh University (February 13, 2020).

2019 "Current Trends in Chronic Traumatic Encephalopathy Research: Past and Present." Lecture at St. Lawrence University (October 24, 2019).

2019 "Punch Drunk and Dementia: Boxing and Domestic Violence, 1870-2005." Department of History." Keynote Address Symposium on Undergraduate Research, Mississippi State University (April 5, 2019).

2018 "The Beautiful Brain: Santiago Ramón y Cajal and the History of the Neurosciences." Silver Center, New York University (February 14, 2018).

2017 "Commentary: A Historian's Reflection on Metaphors, Models and *The Political in* the Mind and Brain Sciences." Metaphors and Models: The Neuroscience of Comparison – Seminars in Society and Neuroscience. Columbia University (November 20, 2017).

2017 "Punch Drunk and Dementia: Boxing and Domestic Violence, 1870-2005." Department of History. University of New Hampshire, New Hampshire (October 19, 2017)

2017 "A History of Locked-in Syndrome: The Making of Neurological Consciousness, 1880-Present." Making Biological Minds Conference. University of Leeds, UK (September 22, 2017)

2017 "Concussion: An Intellectual History, 1870-2012." Neurology Grand Rounds, Geisel School of Medicine, Dartmouth College (May 12, 2017)

2017 “The Discovery of Locked-in Syndrome: A History of Disordered States of Consciousness in an Era of Civil Rights Activism.” Institute for the History of Medicine, Johns Hopkins University (April 20, 2017)

2017 "Locked-In Syndrome and the History of Neurological Consciousness." The Richardson History of Psychiatry Research Seminar Weill Cornell Medical College (January 4, 2017)

2016 “Locked-in Patients/Locked-out Doctors: Histories of Persistent States of Being There.” ICREA Conference Personhood and the Locked-In Syndrome, Autonomous University of Barcelona, Spain. (November, 18, 2016)

2015 “Dualist Techniques For Materialist Imaginaries: Matter and Mind in the 1951 Festival of Britain.” Centre for the History of Science, Medicine, and Technology, Manchester University, UK. (November 24, 2015)

2015 “Making Neurology Global: The First International Neurological Congress in Berne, Switzerland.” World Congress of Neurology, Santiago, Chile. (November 4, 2015)

2014 James V. Warren Memorial Lecture. “Gentleman Generalists: British Neurologists Confront Medical Specialization, 1880-2000.” Ohio State University, Columbus, Ohio. (March 18, 2014)

2014 Neurology Grand Rounds. “The Neurologists: A History of a Medical Specialty in Britain, c. 1789-2000.” Ohio State University, Columbus, Ohio. (March 18, 2014)

2014 “Comment on Max Stadler’s Physiology of the Nervous System.” Soul Catchers: A Conference on the Material History of the Brain Sciences. Princeton University, Princeton, NJ. (February 8, 2014)

2013 “Why ask: ‘What is history?’” State University of New York-Potsdam, Potsdam, NY. Plenary lecture to honors graduates in history. (April 19, 2013)

2013 “The Neurology of Everything: How the Retrospective Reconstruction of British Neurology led to the ‘Decade of the Brain.’” Johns Hopkins University, Baltimore, MD. (March 7, 2013)

2011 “Psychometric Means: Neuropsychiatry and the Ends of Psychometric Testing.” UCL Centre for the History of Medicine, London, UK. (December 5, 2011)

2011 "A Naturalizing Instinct: A History of Brain Science and Politics in Postmodernity." Neuro-Reality-Check, Max-Planck Institute for the History of Science, Berlin, Germany. (December 2, 2011)

2011 "The Neurological Patient in History," History of Health Sciences Lecture, August C. Long Health Sciences Library, Columbia University. (October 13, 2011)

2011 "How Physicians became Neurologists: The Case of Britain, 1800-2000." Neurology Grand Rounds, University of Calgary Medical School, Calgary, Canada. (June 16, 2011)

2010 "The Currency of Consciousness: Neurology and the Global Practices of Medicine." McGill University, Department of Social Studies of Medicine, Montreal, Quebec, Canada. (October 2010)

2010 Reynolds Lecture, "Globalizing Medical Histories." University of Alabama, Birmingham, Birmingham, AL. (May 2010)

2010 "The Specialization of British Neurology." University of Alabama, Department of Neurology, Birmingham, AL. (May 2010)

2010 Grand Rounds. "How Physicians Became Neurologists." Columbia University Medical School, Neurological Institute of New York, New York, NY. (February 2010)

2010 "Legitimizing Us; Pathologizing Them: The Recent History of Neuroauthoriatrianism." Neuroscience and Human Nature. Wellcome Trust Centre for the History of Medicine at University College London, London, UK. (February 2010)

2009 "Gossip or Evidence: The Strange Case of Kathleen Chevassut and the Germ of Multiple Sclerosis." Gallatin School History of Science Series, Gallatin School, New York University, New York, NY. (October 2009)

2007 "Opening Up Medicine: Inclusivity and British Physicians in the 20th Century." Western Michigan University, Kalamazoo, MI. (April 2007)

2007 "The Neurologists: A Global History of a Medical Specialty." University of Birmingham, Birmingham, UK. (March 2007)

2006 "People, Places, and Prosopopeia: A Prosopography of Interwar British Neurologists." Imperial College London, London, UK. (October 2006)

2006 "The Clatter of Discordant Voices: Crises in Medicine in 1916." National Army Museum, London, UK. (August 2006)

CONFERENCE PRESENTATIONS

2021 "A History of Gender Differences and Traumatic Brain Injury "Through the Ages,"" International Brain Injury Association, Zoom Conference, (May 28, 2021).

2021 "The Impact of Sex and Gender on Neurology in Global History". 7th European Academy of Neurology Congress (June 20, 2021).

2018 "Concussion & Agnotology: How postwar violent fantasies, suburban lifestyles, and racial and gender norms constructed a Culture of Ignorance and thereby Made an Invisible Public Health Crisis, 1950-1983 " History of Science Society, Seattle. (November 2, 2018).

2018 "Punch-Drunk and Dementia: A Cultural History of Concussion in Boxing and Domestic Violence, c1928--c1990." American Association for the History of Medicine, Los Angeles. (May 12, 2018).

2018 "Framing Deep Pasts: Atavisms, Retrogressions, and Race Science in the Making of Neuroscientific and Genetic Medicine, c. 1880-1980." Conference on Latin American History, Washington DC. (January 4, 2018)

2015 "Time, Deep History, and the Evolutionary Neurology of Nervous Disease." International Society for the History and Philosophy of Social Science and Biology, Montreal, Canada. (July 9, 2015)

2013 "The Spirit of 'Generalism' in British Neurology: Specialization, State Medicine, and the Making of an Integrative Specialty, 1860-1990." American Association for the History of Medicine, Atlanta, Georgia. (May 18, 2013)

2013 "Open Access and the Future of Scholarly Journals: A Conversation with Journal Editors." American Association for the History of Medicine, Atlanta, Georgia. (May 17, 2013)

2012 "An Integrative Legacy: History & Neuroscience." History of Science Society, San Diego, California. (November 18, 2012)

2011 "Into Mind & Brain: Defining Work in the Integrative Sciences, 1800-1950." Body and Mind Workshop, Cheiron/International Society for the History of Neuroscience, Banff, Canada. (June 20, 2011)

2011 "'A career largely concerned with investigation': E.A. Carmichael, the British State, and Clinical Neurology Research." International Society for the History of Neuroscience, Calgary, Canada. (June 19, 2011)

2010 "Whither Neuroscience? What the Recent History of 'Contagious Shooting' (1982-2006) Says About the Value of the History of the Neurosciences." International Society for the History of Neuroscience, International Society for the History of Neuroscience, Paris, France. (June 2010)

2010 "'The last line of the defense': British Medical Students in North American Medical Schools, 1939-1945." American Association for the History of Medicine, Rochester, MN. (April 2010)

2009 "Making Patients Perform." International Society for the History of Neuroscience, Charleston, SC. (June 2009)

2008 "Neurology and the Practices of Medicine." Workshop on Global Histories of Medicine, Wellcome Trust Centre for the History of Medicine, University College London, London, UK (May 2008)

2008 "Finding Cultural Commonalities in Neutral Territory: The Neurologists and the 1931 First International Neurological Congress, Berne." American Association for the History of Medicine, Rochester, NY. (April 2008)

2008 "Medicine and Science from the Perspective of Global Historians." Annual Meeting of the American Association for the History of Medicine; Cleveland, Ohio. (April 2008)

2007 "How to get kicked out of The Founders of Neurology." International Society for the History of Neuroscience, Los Angeles, CA. (June 2007)

2006 "The Specialization of British Neurology, 1920-1940." History of British Neurosciences, Royal Society of Medicine, London, UK. (December 2006)

2006 "The Foundation of the Association of British Neurologists." Association of British Neurologists, Blackpool, UK. (October 2006)

2006 "Ideologies Young and Old: Comparative Thoughts on Walter Russell Brain's Early Pacifism and Later Professional Philosophy." Scientists and Social Commitment, British Society for the History of Science, London, UK. (September 2006)

2006 "Neurology at Johns Hopkins." Annual Meeting of the American Association for the History of Medicine, Halifax, Canada. (April 2006)

2005 "The Production of 'Fairly Reliable Data': The Question of Civilian Neuroses, 1941-42." International Congress of History of Science, Beijing, China. (August 2005)

TEACHING

Courses at Clarkson University

Ways of Knowing
The Clarkson Seminar
Honors Project Course
Introduction to Global History
History of the Human Sciences
Medicine in Modern Europe and North America
Time and the Body in Medicine
European History: 1789-1914
Science, Technology and the Modern World
Honors Advanced Project Course
Honors Thesis Preparation Course
Neuroscience and Society
World War I in History and Literature

2003-2006 Teaching Assistant, University College London

History of the Human Sciences
History of Biology
Framing Disease
Madness and Literature

TEACHING ADMINISTATION

2020 Honors Summer Research Program Director (10 weeks 1 June 2020-1 August 2020).

Direction of Independent Undergraduate Honors Theses

2017-2018 "Medical Misdiagnosis in a Rural Healthcare Setting: The Case of COPD." Undergraduate honors thesis in Biology.

2012-2013 "Science Fiction and 'The Futurists' in American Culture." Undergraduate honors thesis in History. (*Published as* R. E. Fulton (2016), "Donald A. Wollheim's Authoritative Universe: Editors, Readers, and the Construction of the Science Fiction

Paperback, 1926-1969" *Book History* vol. 19, 349-383).

2011-2012 "The History of the Minnesota Multiphasic Personality Inventory." Undergraduate honors thesis in Psychology, Biomolecular Science.

2009-2010 "Framing 'Schizophrenia.'" Undergraduate honors thesis in Psychology.

2009-2010 "The History of Male Anorexia." Undergraduate honors thesis in History.

PROFESSIONAL SERVICE

2020-Present	Repercussions Concussion Prevention Group (Britain, American, New Zealand, and Australia)
2020	External Promotion Review, Loyala Marymount University
2020	Member, Fellowship Selection Committee, Consortium for the History of Science, Technology, and Medicine, Philadelphia, PA.
2019-Present	Chair, Local Arrangements for the 2022 American Association for the History of Medicine
2019	Chair, Article Prize Committee for the Forum for the History of the Human Sciences
2019	Reviewer, National Endowment for the Humanities Grants Program
2018	Application Reviewer, Consortium for the History of Science, Technology, and Medicine, Philadelphia, PA.
2017-2018	Welch Committee, American Association for the History of Medicine
2016 – 2019	Council, American Association for the History of Medicine
2008-2014	Research Awards Committee, International Society for the History of Neuroscience
2015	Workshop Organizer, *Phrenology, Craniology and Anthropometry in Global and Historical Perspective*. Clarkson University, Potsdam, NY. (Aug 17, 2015 – Aug 18, 2015)
2015	Panel Organizer, International Society for the History and Philosophy of Social Science and Biology, Montreal, Canada (July 4, 2015)

2012	Panel Organizer, History of Science Society, San Diego, CA (November 15, 2012 - November 18, 2012)
2012	Workshop Organizer, *Technique in the Mind and Brain Sciences* Clarkson University, Potsdam, NY. (May 5, 2012 - May 6, 2012)
2011	Session Chair, International Society for the History of Neuroscience, Calgary, Alberta. (June 19, 2011 - June 23, 2011)
2010	Session Chair, History of Science Society, Montreal
2010	Session Chair, Society for the Social History of Medicine, Durham, NC
2009	Session Chair, History of Science Society, Phoenix, AZ

DEPARTMENTAL AND UNIVERSITY SERVICE

Departmental Service

Committee Member, Search Committee for Honors Housing Advisor (May 1, 2019-August 20, 2019).

Committee Member, Search Committee for Honors Scholarship Advisor (Sept 1, 2018-December 1, 2018).

Committee Member, Search Committee for Anthropology (September 1, 2017 – 2018)

Committee Member, Search Committee for Visiting Professor in Anthropology (April 1, 2017 – July 1, 2017)

Committee Chair, Departmental Curriculum Committee (September 1, 2012 - 2014)

Committee Member, Search Committee for Sociology, Anthropology and Geography (September 1, 2013 – January 1, 2014)

Committee Member, Search Committee for Political Science/Sociology (September 2, 2012 - February 28, 2013)

Committee Member, Humanities and Social Science Annual Conference (September 2008 - May 2011)

Committee Chair, Formation Committee for Curriculum Development Committee (September 2009 - April 2010)

University Service

Member, Honors Admissions Committee (January 2018- December 2019)

Chair, Faculty Senate Ad Hoc Committee on Teaching Evaluations (September 2018 – August 2019)

Member, Faculty Senate, Clarkson University (August 2014 – 2019)

Committee Member, Health Science Committee (May 1, 2011 - 2018)

Debate Judge, National Society of Black Engineers (November 8, 2009; April 11, 2010; October 30, 2011; November 11, 2012)

Committee Member, Search Committee for Assistant Dean of Students (August 1, 2012 - September 17, 2012)

Faculty Advisor, Phi Delta Epsilon (September 1, 2011 - September 1, 2012)

Committee Member, Physician Assistant Student Recruitment (June 15, 2011 - September 30, 2011)

Founder and Committee Chair, David A Walsh Arts & Sciences Seminar Series (June 2010 – May 2013)

Committee Member, Search Committee for Founding Director of Physician Assistants Program (October 2009 - February 2010)

PROFESSIONAL MEMBERSHIPS

American Association of History of Medicine

2016-present: Council, American Association of the History of Medicine

2013-2014: Program Committee, American Association of the History of Medicine

2011-2012: Program Committee, American Association of the History of Medicine

2010-2011: Research Awards Committee, American Association for the History of Medicine

American Association of University Professors

American Historical Association
History of Science Society
National Collegiate Honors Council (NCHC)

Exhibit C.

List of Previous Cases

1. Deposed in the matter of *National Hockey League Players' Concussion Injury Litigation*, MDL, 14-2551 SJN.

2. Deposed in the matter of *Archie v. Pop Warner Little Scholars*.