



**Association of Ringside Physicians**

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## From the Editor's Desk

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Dear Colleagues,

It gives me great pleasure to bring to you the sixth issue of the *ARP Journal of Combat Sports Medicine*. The COVID-19 pandemic is still raging in some parts of the world and our thoughts and prayers remain with friends and family residing in these countries. In the United States, active cases are declining, and life slowly is returning to normal. We are physicians first and ringside physicians second. Let us take every opportunity we get while working combat sports events to encourage athletes, trainers, coaches, cut men, referees, judges, promoters, production staff and commission staff members to get vaccinated unless they have a medical or religious reason not to do so.

In this issue of the journal, Lenihan et al. propose good practice guidelines intended to identify, manage, and reduce head impact exposures during training camp. These practical and easy-to-implement interventions are intended to protect combatants' neurological health and reduce incidence of both acute and chronic neurological injuries associated with combat sports. Khabie and Sethi's timely commentary dwells into the controversial issue of whether transgender athletes should be allowed to participate in professional combat sports. Weinstein's study highlights the misconceptions around the most common type of traumatic brain injury (concussion). Concussion is a common sports-related injury and as physicians we play a vital role in educating young athletes about concussion and debunking common myths such as a concussion occurs only when an athlete experiences a loss of consciousness. We have added a new book review section to our journal. In this issue, I have invited Tris Dixon to write about his book "Damage: The Untold Story of Brain Trauma in Boxing". Tris Dixon has written an excellent book that is a must-read for everyone who is passionate about the sport of boxing. Dixon truly presents the viewpoints of all parties in a thorough fashion. In my opinion, everyone should read this book—commission staff, commentators, members of boxing sport governing bodies, referees, doctors who work ringside, coaches, but most importantly, boxers and their families.

The *ARP Journal of Combat Sports Medicine* has been well received by members of the combat sports community. In large part this is due to the hard work and dedication of our two Senior Editorial Managers Lisa Nelson and Susan Rees. Here at the *ARP JCSM* we all are working tirelessly to improve the journal and make it a valuable resource for the combat sports community. The *ARP Journal of Combat Sports Medicine* is actively soliciting case reports, case series, review articles, and original studies related to the field of combat sports medicine. Please consider the journal for publication of your valuable work.

Sincerely,

Nitin K Sethi, MD, MBBS, FAAN

# Transgender athletes in combat sports: to fight or not to fight?

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Keywords: boxing, MMA, transgender combatants

**DISCLOSURES:** The views expressed by the authors are their own and do not necessarily reflect the views of the institutions and organizations which the authors serve.

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There is ongoing debate on transgender athletes' participation in various sports at the amateur and professional levels. Much of the debate is centered around transgender women competing in women's sports, as it is felt that the transgender athlete shall have an unfair advantage over their cisgender woman competitor(s). Higher testosterone level, differences in body fat, musculature, and bony structure are some of the reasons postulated to give the transgender woman an advantage over her cisgender competitor.

The International Olympic Committee (IOC) guidelines require that all transgender women athletes declare their gender and not change that assertion for at least four years, as well as have a testosterone level of less than 10 nanomoles per liter for at least one year prior to competition and throughout the period of eligibility.<sup>1</sup> Could the above IOC guidelines be adopted for combat sports? Should a transgender woman be granted licensure to fight a cisgender woman in a professional boxing or MMA bout? The first question which will need to be answered is whether this shall be a fair bout. While testosterone can be used as metric to ensure fairness at the time of the bout,

many would argue that by a time a transgender woman combatant launches her professional career she has already gone through male puberty, thus conferring her with the musculature and bony structure of a male. Such a combatant may have an unfair advantage over her cisgender woman combatant. Combat sports such as boxing are unique since every punch thrown at the head is thrown with the intention of winning by causing a knockout (aka a concussion), resulting in these sports carrying an exceedingly high risk for both acute and chronic neurological injuries. Boxers have died during a bout or in the immediate aftermath due to traumatic brain injuries (TBIs) such as an acute subdural hematoma (SDH), epidural hematoma (EDH), subarachnoid hemorrhage (SAH), intracranial hematoma, and injury to the great vessels of the neck such as carotid or vertebral artery dissection. Allowing a transgender woman to compete raises concern for the health and safety of her cisgender woman combatant. However, genetic differences are found in athletes of the same sex. Muscle build, joint flexibility, speed, and agility are variable traits which give one athlete an advantage or disadvantage over the opponent(s). These innate genetic traits along with

intense physical training and physical and mental stamina are what give a combatant an edge over a competitor. It is what distinguishes a champion from a runner-up in combat sports.

The IOC allows transgender men athletes (athletes who transitioned from female to male) to participate without any restriction. Should a transgender man be granted licensure to fight a cisgender man in a professional boxing or MMA bout? The first question which will need to be answered is whether this shall be a fair bout. While testosterone can again be used as metric to ensure fairness at the time of the bout, many would argue that by a time a transgender man combatant launches his professional career he has already gone through female puberty thus conferring him with the musculature and bony structure of a female. Such a combatant may be at a disadvantage against his cisgender man combatant. Allowing this bout to take place raises concern for the health and safety of the transgender male combatant. However, in the case of a transgender male with a superior skill set, better training and superior mental and physical stamina than his cisgender male opponent, is a transgender male athlete really at risk of injury competing in this scenario?

Transgender rights is an important issue on which the combat sports community should not turn its back. The combat sports community should recognize the gender identity of an individual and champion to protect transgender individuals against discrimination at their workplace, in employment, education, and access to healthcare. The issue of transgender athletes competing in professional combat sports, though, needs to be debated, scientifically studied, and decided purely on scientific and medical grounds based on concrete evidence-based medicine with the foremost goal of protecting the health and safety of all combatants. In the end, we want two equally skilled and matched athletes competing in the cage or ring, on a level playing field. This is the best way to keep the matches fair, competitive, entertaining, and safe for all combatants. If we follow where the science leads us, we shall accomplish this goal.

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# Safe Sparring Protocol: Reducing Head Impact Exposures During Training in Combat Sports

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Keywords: boxing; MMA; combat sports; concussions; traumatic brain injury; training; sparring.

DISCLOSURES: The views expressed by the authors are their own and do not necessarily reflect the views of the institutions and organizations which the authors represent or serve. The authors have contributed equally to the work and share first author status.

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### **Background**

Concussions and head impact exposures (HIE) are common in professional combat sports of boxing and mixed martial arts (MMA) where every punch thrown at the head is thrown with the intention of winning by causing a knock-out (KO). In these sports one may thus argue that concussions and HIEs are inevitable and unavoidable. The incidence and prevalence of these injuries while the combatant is in training (camp) has not been systematically studied but is likely high.

### **Discussion**

Good practice guidelines are proposed and intended to identify, manage, and reduce HIEs during training camp. These interventions will protect combatants' neurological health and reduce the incidence of both acute and chronic neurological injuries associated with combat sports.

### **Conclusion.**

Developing and implementing standardized guidelines and protocols to follow during training shall help reduce concussion and HIE burden in the

combat sports athlete. The proposed guidelines should be debated vigorously by the combat sports community, professional boxing and MMA governing bodies, regulatory combat sports commissions, the wider scientific community, with the goal to develop and possess evidence-based guidelines designed to reduce concussions and HIEs during training camps.

In a recent study published in *JAMA Neurology*, McCrea et al. found that college football players still experience 72% of their concussions and 67% of their total head impact exposures (HIE) in practice.<sup>1</sup> Commenting on the study Nowinsky and Cantu make an important point when they say, "concussions in games are inevitable, but concussions in practice are preventable. Practices are controlled situations where coaches have almost complete authority over the HIE risks taken by players".<sup>2</sup> Combat sports such as boxing and MMA are associated with high risk of both acute and chronic neurological injuries. While acute subdural hematoma is the most common cause of boxing related mortality, the burden of chronic neurological injuries such as chronic posttraumatic headaches, chronic posttraumatic dizziness,



posttraumatic cognitive impairment, posttraumatic Parkinsonism, posttraumatic dementia, dementia pugilistica, Punch Drunk Syndrome, CTE and neuropsychological sequelae such as mood, behavioral changes and depression is likely much larger and hidden from view. The risk of chronic neurological injuries increases with the number of HIEs combatants sustain during their career. While data with respect to boxing and MMA are lacking, it is likely that McCrea's et al. findings apply to these sports as well. Paraphrasing Drs. Nowinsky and Cantu, concussions in boxing and MMA are inevitable during a bout, but concussions in training and sparring are certainly preventable.

In most commission jurisdictions, professional boxing and MMA bouts are fought under close medical supervision. There is a qualified ringside physician in each corner watching for concussions and HIEs among other combat sports injuries. Leading up to a big fight event, a fighter usually participates in a training camp. In preparation for the fight, the pugilist undergoes a grueling regime incorporating running, high-intensity interval training, strength and conditioning exercises, boxing drills and mitt/pad work. Most training camps are 10-12 weeks long, though shorter and longer training camps may be held in preparation for a maximum of 36 minutes of actual competition. Sparring is an important component of any professional boxer's training camp. The number of rounds of sparring a boxer puts in during a training camp vary with numbers ranging from 40 to 150 rounds. There is little to no medical supervision of this sparring and likely concussions and HIEs are common.

To protect the brain and cognitive health of professional combatants the following good practice guidelines are suggested. It is further recommended that the proposed guidelines be debated vigorously by the combat sports community (professional combatants, trainers, coaches), professional boxing and MMA governing bodies and scientific community. Evidence based guidelines should then be developed and adopted by all concerned parties and organizations.

The following good practice sparring guidelines are proposed based on personal and collective evidence of the authors:

1. **Pre-assessment:** It is recommended that the combatant's neurological status be assessed prior to the start of the training camp. Evaluation by a neurologist or a physician trained in sports medicine is ideal and serves to establish the combatant's baseline against which post-training camp or post-fight evaluations can be compared.
2. **Education:** It is recommended that all members of the training camp be educated about concussion identification and management. This especially includes the combatant. It is also recommended that the head trainer and coach take a formal training course in concussion recognition and management such as the "Heads-Up Online Concussion Training Certification Course for Coaches", developed by the Centers for Disease Control and Prevention (CDC). Symptoms of mild concussion are predominantly subjective with little to no objective signs. Headache, blurred vision, light and sound sensitivity, nausea, brain fog, attention or concentration difficulty, unsteadiness on feet after a HIE are all signs of concussion. Such a combatant should not be allowed to proceed with training and should be evaluated by a medical professional. If a concussion is documented, a period of cognitive and physical rest is advised. Once the acute post-concussion symptoms have abated, a return-to-fighting protocol is initiated.<sup>3</sup> Sparring can resume after medical clearance by the physician.
3. **Headgear:** It is recommended that full headgear be worn by combatants and their opponents (sparring partners) during sparring. Under close observation, an exception may be considered for a boxer scheduled to make a professional debut. Some trainers may prefer to remove the headgear a few times towards the end of camp, so that the

boxer can become accustomed to boxing without it. This practice should be limited and only attempted under close trainer supervision. The Amateur International Boxing Association (AIBA) rule change to remove headgear during fights has been controversial. AIBA has claimed that this rule change will actually reduce HIEs as head guards lead to weaponization of the head where boxers develop a style of competing with head more forward and more head-to-head contact. AIBA has further stated that headgear worn by professional boxers in practice are meant to prevent facial lacerations (cuts) and not concussions. Professional boxing organizations such as the World Boxing Council have pushed back aggressively against this AIBA rule change and recommended that headgear be worn during all sparring sessions.<sup>4-9</sup>

4. **Body protectors:** It is recommended that body protectors be worn if there is a pre-existing injury.
5. **Gloves:** It is recommended that sparring almost always be done with 16-ounce gloves. The exception to this is big heavyweights who may use 18-ounce gloves, and combatants 150 pounds or under may use 14-ounce gloves. Only gloves from a reputable manufacturer should be used for sparring.
6. **Mouthpieces:** It is recommended that mouthpieces custom made by a dentist be worn during sparring. Although studies involving football, rugby, and ice hockey players seem to show that mouthpieces may play a positive role in helping to reduce and/or prevent concussions, there are few to no studies studying the impact of wearing such pieces on reducing concussions and HIEs in combat sports.<sup>10-11</sup> Mouthguards have been shown to reduce and/or prevent associated orofacial injuries, which may impact a fighter's ability to defend themselves effectively and/or their future fight career.<sup>12-13</sup>
7. **Sparring:** It is recommended that sparring be conducted only under the supervision of the trainer(s). There are three types of sparring that can occur in a camp. Sparring with boxers above the combatant's level to "learn from them", sparring against boxers at par with the combatant to test ability against equally matched competition, and sparring with boxers below the combatant's level to allow combatant "to take chances and try new things", without a great risk. During an 8-week training camp sparring usually occurs 3-4 times per week. If preparing for a 10-round bout, sparring usually will begin during the second week of camp and the combatant will start sparring 6 rounds a day, working his way up to 12 rounds a day. The combatant tries to condition himself mentally and physically to spar more rounds than the scheduled bout. Usually there is no sparring on the first and last week of camp. Sparring may be limited on any day based on performance or other concerns. Sparring should be controlled and be used to work on offensive and defensive technique only. The selection of sparring partner(s) needs careful consideration. Sparring partners that are brought in to be nothing more than "punching bags" and to absorb punishment is strongly discouraged. Sometimes heavier sparring partners are brought in to make the combatant "work harder." It is also thought that heavier sparring partner(s) can better absorb the punishment from a smaller combatant. This practice, while understandable, needs to be discouraged. Sparring partners should be limited to no more than 10-15 pounds more than the combatant. When smaller sparring partner(s) are used to help condition the combatant for speed, the combatant should be instructed to "hold back" on punches. Protecting the sparring partners from concussions and HIEs is the responsibility of the trainer.

8. **Hydration:** It is recommended that the hydration and nutritional status of the combatant be closely monitored during training. A qualified dietician and/or nutritionist can serve as a valuable member of the training camp.
9. **Medical oversight of the training camp:** It is recommended that a qualified physician serve as a consultant for the training camp. This physician can be the combatant's primary care physician (PCP) with whom the combatant already has an established and trusting patient-doctor relationship. The physician can be consulted as needed if any medical concerns or HIEs arise during the training camp. Use of the standardized assessment of concussion test (SCAT5) is recommended for evaluation of concussion.
10. **Training camp diary:** It is recommended that a training camp diary be maintained by the trainer. All aspects of the training should be detailed in this diary from commencement until end of camp, which should include daily weight, hydration, and nutrition status, sparring details, and concussions or HIE(s) during training. This should include knock downs and knock outs (if any) during sparring.

### ***Discussion***

The purpose of these guidelines is to decrease the risk of cumulative head trauma associated with sparring and training. Cumulative head trauma may result in both short-term and long-term neurologic consequences. This is a problem of cumulative kinetic energy being delivered to the brain over a given period of time. Concussions fall at one end of the mild traumatic brain injury spectrum; however, repetitive concussions and subconcussive HIEs contribute to the development of chronic neurologic injury. Limiting the size of the opponent to his or her own weight class will limit the force generated by a blow to the head. To dissipate some of this energy away from the brain,

appropriate gloves and headgear should be used during sparring. In addition, neck strengthening helps transmit some of this energy away from the head.<sup>14</sup> An appropriately sized mouthguard also helps absorb some of this energy although the scientific literature on this is not as strong. Finally, limiting the exposure to trauma will decrease the risk of neurologic sequelae. This may be done by limiting the number of rounds of sparring over the training period.

If combatants, trainers, and coaches do not follow our recommendations, the changes we prescribe will have little effect. Combatants may be more likely to follow the guidelines if they realize cumulative head trauma may hinder their athletic performance. The consequences of "neurologic sequelae of multiple concussions and HIEs" should be made clear to all concerned parties. The sequelae include but are not limited to poor balance and decreased reaction time. An NCAA study revealed that those athletes who were exposed to more sub-concussive head impacts during practice had a lower threshold for concussion in the game.<sup>4</sup> In combatants, this translates to a "weaker chin."<sup>15</sup> Allowing for more recovery between sparring sessions and after competition will allow for optimal performance.

### ***Conclusion***

Many combat sports athletes are now aware of the long-term sequelae of boxing such as chronic traumatic encephalopathy. The risks though may seem far off for them when they are actively competing. Reducing HIEs and concussions during sparring shall help mitigate some of these risks.

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# COMMON MISCONCEPTIONS SURROUNDING CONCUSSION: RESULTS OF A SURVEY

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**KEYWORDS:** concussion, traumatic brain injury, sports

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## *Background*

Over the years the definition of concussion has evolved from a transient disorder of brain function without long-term sequelae to one now which recognizes that concussion(s) may have long-term sequelae and allows the presence of neuropathological damage. We still lack a single definition of concussion and definitions put forth by various professional organizations such as the American Academy of Neurology (AAN) (alteration of mental status due to a biomechanical forces affecting the brain) and the American Association of Neurological Surgeons (AANS) (clinical syndrome characterized by immediate and transient alteration in brain function, including alteration of mental status and level of consciousness, resulting from mechanical force or trauma) have subtle yet significant differences. Of note AAN definition does not require a loss of consciousness. In the absence of a unified definition, the term “concussion” is used rather loosely in both medical and non-medical literature. We administered a questionnaire to 42 college students (aged between 18 to 23 years) to gauge their understanding of concussion and identify common misconceptions related to this common form of closed head injury.

## *Methods*

A Google Forms questionnaire consisting of seven questions was administered to 42 college students ages 18 to 23 years old to gauge their understanding of concussions and identify common misconceptions surrounding this most common type of closed head injury. One week after the survey was originally administered, two questions were added to determine the presence of other misconceptions among the sample population. The final questionnaire included nine questions (Table 1). In total, 54 college students responded to the survey, 12 of which answering the two questions added later. The students enrolled in the study currently attend one of the following accredited universities or college: Cornell University (44), University of Michigan (2), University of Wisconsin (2), Northwestern University (1), Vanderbilt University (1), University of Texas (1), Emory University (1), Boston College (1), Binghamton University (1).

**Table 1**

“College Student Survey: Concussions” Questions

Question Number	Question	Response Type
1	“Have you played a sport in the past?”	Multiple Choice: “Yes” OR “No”
2	“If you answered yes above, what was the highest skill level?”	Multiple Choice: “Recreational” OR “JV/Varsity” OR “Intramural/Club” OR “College Level”
3	“Have you ever experienced a concussion?”	Multiple Choice: “Yes” OR “No”
4	“In your own words, how would you define a concussion?”	Short Answer Text
5	“What are the symptoms often associated with a concussion?”	Short Answer Text
6	“In your opinion, is there a difference between a concussion and traumatic brain injury and why?”	Short Answer Text
7	“Do you think a concussion can only occur if a person has lost consciousness?”	Multiple Choice: “Yes” OR “No”
8 <sup>a</sup>	“Do you believe that the majority of concussions are accompanied by a loss of consciousness?”	Multiple Choice: “Yes” OR “No”
9 <sup>a</sup>	“Should a person be kept awake for a period of 24 hours after suffering a head injury?”	Multiple Choice: “Yes” OR “No”

All questions required responses to submit the questionnaire.

a. Questions 8 and 9 were added to the survey one week after questions 1-7. Exactly 12 out of 54 (22.2%) total respondents answered questions 8 and 9.

## Results

The results of the survey are tabulated in Table 2.

All 54 collegiate students enrolled in this study indicated they have played an organized sport in the past, including 7 college-level athletes. Further, 16 of 54 (29.6%) respondents indicated that they have experienced a concussion at some point prior to taking the questionnaire.

Various misconceptions surrounding concussions were identified. The sample population provided several varying responses as to how they would define a concussion. Among other answers, 15 students defined a concussion as a “brain injury,” 9

defined it as some sort of hit to the head, and 2 even described it as an injury that can only occur if it has been “medically diagnosed.” One student defined a concussion as “when the brain moves around in the skull,” while another simply defined it as “a contusion to the skull.”

Disagreement relating to symptoms often associated with concussions also existed within this sample. Only 13 (24.1%) and 8 (14.8%) students, respectively, classified “memory loss” and “confusion” as symptoms related to a concussion, although both of which are relevant when diagnosing a concussion. It is worth noting that none of the respondents mentioned vomiting or lack of coordination as a symptom in their answers.

The most alarming misconception within this student population was related to the difference between a concussion and traumatic brain injury. 22 of 54 (40.7%) respondents answered that there was no difference between a concussion and a TBI, and 4 of 54 were unsure. Of those that did identify a difference (28/54), a multitude of reasons were provided in support of their answer. For example, one student wrote: “Yes. Concussions are physical, TBI can be chemical or physical.”

Several misunderstandings relating concussions to a loss of consciousness exist among the general public. Per responses to questions eight and nine, 53 of 54 students correctly responded that loss of consciousness is not necessary for a concussion to occur; however, 6 of the 12 (50%) students (those that were provided with question eight) believed that the majority of concussions do involve a loss of consciousness.

The last myth was that one needs to keep someone who has suffered a concussion awake for a certain period of time immediately following their concussion. Eight of the 12 (66.7%) students that answered question nine incorrectly claimed that a person should be kept awake for 24 hours after a head injury.

### ***Discussion***

We currently lack a uniform definition of concussion which adds to the confusion surrounding this most common type of closed head injury.<sup>1</sup> Misconceptions surrounding concussion are common even in educated, college-going young adults. Many still believe that loss of consciousness is necessary for a concussion to be diagnosed. A mild concussion such as that which occurs after a helmet-to-helmet contact while playing football, or if a person walks into a door or bumps his/her head against a hard surface causes no loss of consciousness. The person may be dazed for a few seconds and “see the stars” or have his “bell rung”. These are mild concussions and need to be treated as such (a period of cognitive and physical rest and then a graded and gradual return to work and exercise). Such people do not need neuroimaging which is

another misconception and people frequently rush to the emergency department or urgent care centres for imaging studies worried that may have a bleed in the brain.

Many people are still unaware that a direct impact to the head is not needed for a concussion to occur and that an abrupt change in acceleration or sudden deceleration of the head such as that occurs in whiplash injuries sustained in car accidents or a sudden fall can result in a transmission of forces to the head and cause a concussive injury. People are unaware that a concussion (closed head injury) is different from a penetrating head injury (such as a bullet shot to the head). In concussion, nothing “physically enters the brain” and it is a transmission of forces across the bony cranium. The concussive properties of a blow to the head are related to the manner the linear (translation) and rotational (angular) acceleration forces generated are delivered to the cranium and at times due to impact deceleration which occurs when the person falls after a blow to the head.

Many are unaware that concussion symptoms, especially those of a mild concussion, are subtle, varied, and wholly subjective. Mild intermittent headache; a sense of pressure in the head; a degree of light and sound sensitivity; subjective sensation of dizziness; nausea; cognitive symptoms such as foggy or fuzzy feeling in the head; poor attention; poor concentration; impaired short-term memory; and mood and behavioral changes after a head impact may indicate a concussive injury.

There is a common misconception (myth) that persons, after a head injury, should be kept awake for a period of 24 hours. It is unclear how this myth originated and persists. The likely cause of this myth is the widely reported “lucid-interval after a head injury”. It is important to recognize that this walking-talking and dying presentation of lucid-interval is seen in relation to epidural and sometimes subdural hematomas. In most concussions, there is no intra-axial or extra-axial hemorrhage. These patients do not need to be kept awake for 24 hours for observation. Sleep is beneficial in patients who have suffered a concussion and so if there are no

**Table 2**

Survey Responses

Question Number	Number of Responses	Responses
1	54 out of 54	Yes 54 (100%) No 0 (0%)
2	54 out of 54	Recreational 3 (5.6%) JV/Varsity 34 (63%) Intramural/Club 10 (18.5%) College Level 7 (13%)
3	54 out of 54	Yes 16 (29.6%) No 38 (70.4%)
4	54 out of 54	Keyword(s) <sup>a</sup> : "Brain Injury" 15 (27.8%) Due to: "Hit/Trauma to head" 3 "Blow/Collision/Impact to head" 4 "Force" 1 "Shaking/Movement of head" 2 "n/a"* 5 "Hit(3)/Collision(3)/Impact(1)/Blow(1)/Force(1) to head" 9 (16.7%) "Head Injury" 8 (14.8%) Due to: "Impact" 1 "n/a" 7* "Brain Shakes(3)/Moves(2)/Rattled(1)" 6 (11.1%) "Head Trauma" 5 (9.3%) Due to: "Brain/Violent shaking" 2 "n/a" 3* "Medically Diagnosed" 2 (3.7%) "Brain Damage" 2 (3.7%) Other** 7 (13.0%)
5	54 out of 54	Keyword(s) <sup>b</sup> : "Headache/Migraine" 42 (77.8%) "Dizziness" 27 (50.0%) "Nausea" 21 (38.9%) "Sensitivity to Light" 18 (33.3%) "Memory Loss" 13 (24.1%) "Confusion" 8 (14.8%) "Lack of Focus/Concentration" 8 (14.8%) "Blurred Vision" 7 (13.0%) "Fatigue/Tiredness/Drowsiness" 5 (9.3%) Other** 23 (42.6%)
6	54 out of 54	Keyword(s) <sup>a</sup> : "Yes" 28 (51.9%) Because: "TBI is more severe(3)/more serious(2)/worse(2)" 7 "TBI leaves permanent damage(4)/impairment(1)" 5 "Concussion is less severe(2)/less serious(1)/less significant(1)/lighter(1)" 5 "You can have a concussion without TBI" 2 "Depends on severity of concussion" 2 "Other" 7 "No" 22 (40.7%) "Unsure" 4 (7.4%)

*Table continued on next page*



red flags, patients can be allowed to rest and fall asleep after a concussion.

The type of recovery from a concussion is anywhere between 2-4 weeks. Symptom duration, however, is highly variable. Prolonged cocooning is nowadays not recommended. Patients are advised cognitive and physical rest till acute symptoms abate and should then be instructed to begin a graded and gradual return to pre-concussion work and exercise schedule.<sup>2,3</sup> Patients should be advised that one does not go from 0 (complete cognitive and physical rest) to 100 (pre-concussion work and exercise baseline) overnight. It is important to dispel this misconception and to educate the public that recovery from concussion should take place in a graded and gradual manner as tolerated.

Our survey was administered to a group of collegiate students most of whom had played an organized sport in the past, including seven college-level athletes. Most student athletes receive concussion education especially if they play organized sport at the college level. Our study highlights that even in this highly educated cohort, there is poor awareness of the cognitive and behavioral symptoms of

concussion. Students used many different phrases/key words to define a concussion and struggled when asked to differentiate a concussion from TBI. The majority correctly stated that loss of consciousness was not necessary for a concussion to occur. The most common myth identified was that a person should be kept awake for 24 hours following a head injury.

### Conclusion

A standardized definition of concussion is the need of the hour. A standardized definition of concussion shall help to dispel the various misconceptions around this most common type of closed head injury. In the absence of a standardized definition the term concussion should be used cautiously and instead physicians should use terms such as possible, mild (probable), moderate or severe traumatic brain injury (TBI) when discussing these injuries with the lay public. Physicians should use every opportunity to educate the public about the symptoms of concussion, many of which are subtle and entirely subjective. Ongoing education initiatives shall help dispel some of the myths and misconceptions surrounding this most common type of closed head injury.

**Table 2** (continued)

7	54 out of 54	Yes 1 (1.9%) No 53 (98.1%)
8 <sup>a</sup>	12 out of 54	Yes 6 (50%) No 6 (50%)
9 <sup>a</sup>	12 out of 54	Yes 8 (66.7%) No 4 (33.3%)

TBI Traumatic Brain Injury

- a. Keyword(s) defined as a word/phrase appearing >1 time in total responses
- a. Keyword(s) defined as a word/phrase appearing >1 time in total responses. Keyword(s) recorded as frequency of occurrence from all responses. Percentages do not add up to 100
- \* "n/a" defined as responses only including keyword with no further explanation
- \*\* "Other" defined as keywords appearing < 2 times

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## BOOK REVIEW: AUTHOR'S PERSPECTIVE

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### **Damage: The Untold Story of Brain Trauma in Boxing**

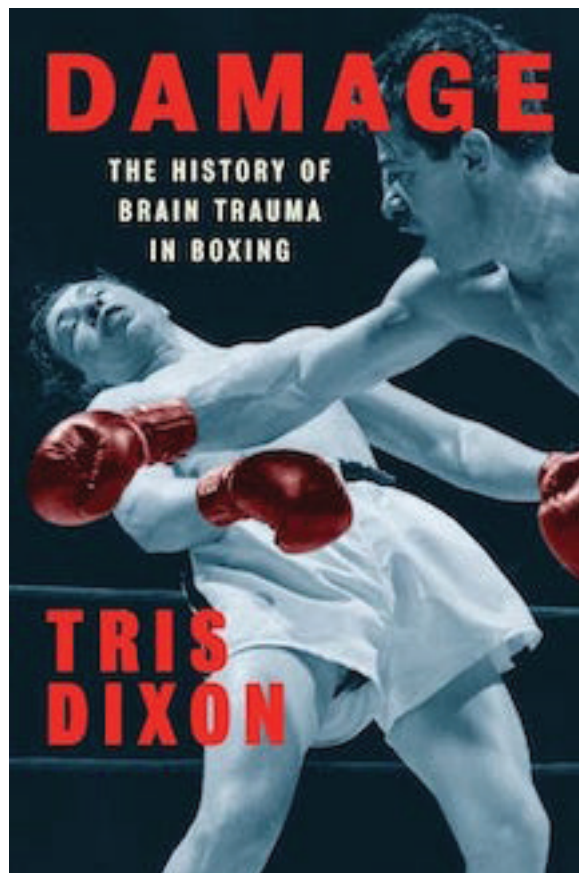
**Author:** Tris Dixon

**Publisher:** Hamilcar Publications

Boxing can be all-consuming for those who are passionate about it. It's transitioned from mainstream to niche, its fans vary from hardcore to casual and, like many sports, the top 1 percent of the stars probably make 99 percent of the money. But life after boxing has its pitfalls even for the one percent, let alone the thousands who do not make what they hoped to make or achieve what they had dreamed of.

We all know that lines of success and failure can be incredibly fine, but in boxing they could be one punch or one feint to the left rather than the right and all of the hard work can be undone or, worst case scenario, a career could be over. Life after boxing has always seemed so hazardous for fighters to navigate. The old stereotype played out over more than a century has been a guy who was a champion, later on the radio or on TV, and is then struggling for money and a shadow of his former self.

I'd wanted to write about why fighters find it so difficult, why even the best toil, what they missed, what they needed, how it could have been different for them. In recent years, three of the biggest names in British boxing, Ricky Hatton, Joe Calzaghe, and Frank Bruno have all endured their personal battles despite having what others would covet and fantasize about and even though they scaled the summit of the sport. There appears a common thread, that the identity of being a fighter is hard to give up. Once you retire, you feel you are no longer the same person, either in other people's eyes or, worse still, in your own. Then there's the loss of a routine. All of a sudden, you're no longer driven to wake up early and pound the roads and get to the gym and a sense of purpose is lost and



grieved over. Then there's the addictive buzz of fight night, of confronting your fears, being saluted by a roaring crowd, having your hand raised and basking in the applause. That is the one that can't be replaced no matter what, and plenty have tried, whether it's been through drugs, women, or gambling they've tried to replicate the euphoria but to a man they have failed each and every time.

In 2012, I wrote a piece about depression in boxing. It seemed to be everywhere I looked. I'd known young fighters who had taken their own lives, a matchmaker, a journalist, trainers, and I looked at how the hyper-masculine roles and the characters people in the sport play led them to insulate their feelings and not speak about their emotions, fears, or feelings. That created a pressure that is hard to take if there is nowhere for the

pressure to go. But it was only when I was reading *The League of Denial* – about the NFL’s Concussion Crisis – that parts of the above narratives began to make sense. As I learned about Mike Webster and other fallen gridiron giants, I drew parallels with boxing and learned about the behavioural issues associated with chronic traumatic encephalopathy (CTE). Depression was there, mood swings, decision-making, impulsivity and then, in the darker shadows, were suicide and murder.

It was like reading a history of boxing as the body count racked up, so I started to look in to CTE. Finding out that what was being discussed was a modern version of Punch Drunk Syndrome was eye-opening. I’d boxed as an amateur from 1996 to 2006, and I hadn’t done it very well. I’d become the editor of the world’s oldest boxing magazine, *Boxing News*, and I had no idea what CTE or tau protein was, but I started to learn as I read *League of Denial*.

I was astonished, and I was angry at myself. I was a knucklehead who could always joke, “I know getting hit in the head isn’t good for you.” I would always say, “Fighters knew the risks.”

But after 20 years in the sport no one had said CTE or tau to me once. No one had talked about the behavioural symptoms. No one had known what Second-impact Syndrome was. No one had talked about the links to Parkinson’s, Alzheimer’s, ALS, or dementia. When people said they were aware of the dangers I was, and am, convinced they’re talking about being stretchered out on fight night, they aren’t thinking of a long, slow decent into darkness that has accounted for so many fighters.

And that sad fading to black has so often provoked little more than a shrug of the shoulders in boxing circles at gala events and dinners only for someone to mutter, “He’s punchy” and then they return to their conversation. In boxing, punch drunk is a dirty phrase – perhaps the dirtiest. Old timers and old medical professionals warned it would happen to fighters who weren’t very good, journeymen, sparring partners, but as the years went

by the fighters who suffered from neurological illnesses included just about every great you could care to mention, from Muhammad Ali to Willie Pep, from Joe Louis to Sugar Ray Robinson, from Henry Armstrong to Wilfred Benitez.

It’s a depressing list and only getting longer which is why I’ve written *Damage: The Untold Story of Brain Trauma in Boxing*. Much has been written about acute damage in boxing but there’s so little attention to the long-term damage. I’ve made friends with injured fighters over the years and for the book I’ve met more, and also talked to the family who have helped pick up the pieces in life after boxing. I’ve spoken to leading neurologists, boxing trainers, broadcasters and journalists, legends, journeymen, those who have struggled and but also those who have thrived. Of course, not every tragedy can be put down to brain trauma or CTE but it needs to be part of a very important conversation held within boxing. Many fighters come from extreme poverty or fight out of some kind of personal trauma, it is often what drives them, but the behaviours we so often see and stories we so regularly hear can’t just be put down to socio-economics and those within the sport, in any position and at any level, need to become comfortable talking about a subject that for too long has been uncomfortable to confront.

-Tris Dixon

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### Examples:

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Nathan JP, Grossman S. Professional reading habits of pharmacists attending 2 educational seminars in New York City. *J Pharm Practice*. 2012;25(6):600-605.

#### Print Journal (more than six authors)

Geller AC, Venna S, Prout M, et al. Should the skin cancer examination be taught in medical school? *Arch Dermatol*. 2002;138(9):1201-1203.

#### Electronic Journal Article

##### Without a Digital Object Identifier (DOI)

Aggleton JP. Understanding anterograde amnesia: disconnections and hidden lesions. *QJ Exp Psychol*. 2008;61(10):1441-1471. <http://search.ebscohost.com/login.aspx?direct=true&db=pbh&AN=34168185&site=ehost-live> Accessed March 18, 2010.

##### With DOI:

Gage BF, Fihn SD, White RH. Management and dosing of warfarin therapy. *The American Journal of Medicine*. 2000;109(6):481-488. doi:10.1016/S0002-9343(00)00545-3.

#### Journal Article with No Named Author or Group Name:

Centers for Disease Control and Prevention (CDC). Licensure of a meningococcal conjugate vaccine (Menveo) and guidance for use--Advisory Committee on Immunization Practices (ACIP), 2010. *MMWR Morb Mortal Wkly Rep*. 2010;59(9):273.

#### Entire Book

Rantucci MJ. *Pharmacists Talking With Patients: A Guide to Patient Counseling*. 2nd ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2007.

#### Book Chapter

Solensky R. Drug allergy: desensitization and treatment of reactions to antibiotics and aspirin. In: Lockey P, ed. *Allergens and Allergen Immunotherapy*. 3rd ed. New York, NY: Marcel Dekker; 2004:585-606.

#### Website

Canadian Press. Generic drugs to be bought in bulk by provinces. CBC News. <http://www.cbc.ca/news/canada/saskatchewan/story/2013/01/18/drug-costs-provinces.html>. Published January 18, 2013. Updated January 18, 2013. Accessed February 4, 2013.

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6. Conclusion/Summary
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