

Neurologic Health in Combat Sports



Tad Seifert, MD

KEYWORDS

- Combat sports • Neurologic injuries • Neurologic health • Combat sports clinicians

KEY POINTS

- Neurologic injuries of both an acute and chronic nature have been reported in the literature for various combat sport styles; however, reports of the incidence and prevalence of these injury types vary greatly.
- Combat sports clinicians must continue to strive for the development, implementation, and enforcement of uniform minimum requirements for brain safety.
- These health care providers must also seize on the honor to provide this oft-underserved population with the health care advocacy they very much deserve, but often do not receive.

INTRODUCTION

Because combat sports encourage deliberate blows to the head, much of the world's medical community has spoken out against this genre of sport, including the American Academy of Pediatrics and the American, Canadian, Australian, British and World medical associations.¹⁻⁶ Despite this opposition, mixed martial arts (MMA) continues to rapidly gain acceptance as a genuine combat sport, and is currently more popular than boxing, the National Hockey League (NHL), and the National Association for Stock Car Auto Racing (NASCAR) amongst males 18 to 34 years of age.⁷ Boxing and MMA alike are both watched by millions of spectators annually in the United States and abroad. The May 2, 2015 "Fight of the Century" bout between Manny Pacquiao and Floyd Mayweather, Jr. generated 4.6 million pay-per-view purchases and generated a revenue of over \$400 million; both figures remain all-time records within the world of combat sports. In the summer of 2016, the Ultimate Fighting Championship (UFC) was purchased by a group of outside investors for \$4.2 billion, which was remarkable considering its original purchase for \$2 million in 2000. Up to one-half of all fights in boxing, karate, and taekwondo result in injury, with a significant number of these injuries being to the head and neck region.⁸⁻¹³ Despite this elevated public interest, chronic traumatic brain injury (CTBI) remains the most predominant safety

Norton Healthcare, 3991 Dutchmans Lane, Suite 310, Louisville, KY 40207, USA
E-mail address: Tad.Seifert@nortonhealthcare.org

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challenge in modern-day combat sports. With its inevitable association with central nervous system trauma, it is imperative that neurologists maintain an open line of communication and understanding with its combatants.

Boxing and other combat sports are different than other sporting pursuits due to the head being an intended and targeted place of contact. Despite the inherent goal of attempting to concuss an opponent, the current author suggests that calls to ban this genre of sport overlook the inherent benefit of active medical involvement in the context of combat sports. Sports medicine providers should emphasize the associated risks, insist on adequate safety precautions, and even prevent future participation due to disqualifying medical conditions. I stop short, however, of unwavering opposition due to other associated factors, such as socioeconomic considerations and the benefit of exercise, self-discipline, and familial structure. In a sports genre where a significant portion of participants arrive from humble socioeconomic backgrounds, the value of health care advocacy provided by sports medicine personnel cannot be underestimated.

Combat sports participation is associated with a risk of neurologic injury, both acute and chronic in nature. CTBI includes a number of disorders that are associated with long-term neurologic sequelae, including persistent post-traumatic headache, chronic postconcussion syndrome, post-traumatic Parkinsonism, post-traumatic dementia, dementia pugilistica, and chronic traumatic encephalopathy (CTE). Previous studies have estimated 20% to 50% of former boxers have symptoms of chronic brain injury.¹⁴ Combat sport athletes are exposed to thousands of blows to the head over the course of their careers, with the cumulative endpoint often being that of chronic neurologic impairment. The complex mixture of applied force, induced head movement, and neurophysiological state at the time of injury contributes to the type & severity of brain injury incurred. Furthermore, there may be a time period of increased vulnerability after TBI where the brain is physiologically more susceptible to recurrent injury at a lower threshold. The early identification of high risk fighters is imperative to facilitate primary prevention efforts, such as decreasing the likelihood of reinjury (secondary prevention), and ensuring access to appropriate interventions that may reduce both personal and aggregate costs (tertiary prevention). The precise threshold of force necessary to induce both acute and chronic neuropathology remains unknown; therefore, the accurate and timely detection of neurologic injury in combat sports is of critical importance so that appropriate therapeutic management may be initiated.

ACUTE AND CHRONIC BRAIN INJURY

Issues regarding the neurologic health of fighters are generally divided into three categories: (1) pre-participation exams to assess baseline status (2) return to fight progression after concussion, and (3) serial assessments to evaluate the aptitude for continued sport participation. Most major professional sports leagues within the United States have formal concussion policies in place; however, return-to-fight management in combat sports participants remains much less standardized. Commonly used guidelines for return-to-sport progression after concussion are inconsistently applied, with significant variability being dependent upon the jurisdiction of medical suspension. In MMA and boxing, medical suspensions are generally issued after a technical knockout (TKO) or knockout (KO). During these restricted periods, fighters are prohibited from sparring and competition, but not from other activities, such non-contact risk conditioning. These suspensions range from 30 to 180 days, but vary greatly in criteria, uniformity, and regulation by the various athletic commissions.^{15–18} The transient nature of fighters also provides a frequent barrier in delivering

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