

Ethical Issues Surrounding Concussions and Player Safety in Professional Ice Hockey

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Abstract Concussions in professional sports have received increased attention, which is partly attributable to evidence that found concussion incidence rates were much higher than previously thought (Echlin et al. *Journal of Neurosurgical Focus* 29:1–10, 2010). Further to this, professional hockey players articulated how their concussion symptoms affected their professional careers, interpersonal relationships, and qualities of life (Caron et al. *Journal of Sport & Exercise Psychology* 35:168–179, 2013). Researchers are beginning to associate multiple/repeated concussions with Chronic Traumatic Encephalopathy (CTE), a structural brain injury that is characterized by tau protein deposits in distinct areas of the brain (McKee et al. *Brain* 136:43–64, 2013). Taken together, concussions impact many people in the sporting community from current and former professional athletes and their families to medical and health professionals and researchers. In light of the growing awareness and sensitivity towards concussions, the purpose of this paper is to provide recommendations that are designed to improve player safety in professional hockey and address the ethical issues surrounding these suggestions.

Keywords Concussions · Ice hockey · Professional sports · Safety

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Introduction

In recent years, sports-related concussions have been discussed, debated, and disseminated in many places and platforms ranging from coffee shops to popular media outlets to scientific conferences. In Canada, concussions have received increased attention primarily due to a number of high profile incidents in professional hockey. For example, the careers of National Hockey League (NHL) superstars Eric Lindros and Chris Pronger were severely affected due to post-concussion symptoms. Moreover, Sidney Crosby, arguably the best player in the NHL, has a well-documented history of concussion injuries. Research found that professional hockey players have endured short- and long-term physical and psychological concussion symptoms that persisted from weeks to years [2]. These symptoms affected their careers, qualities of life, and influenced relationships with those closest to them [2]. Given the increasing incidence of concussions in hockey [1], along with the physical and psychological symptoms that accompany them, professional hockey leagues are like any other employer that have an ethical responsibility to foster a safe workplace environment for their employees.

While there is growing concern over concussions in the NHL, other North American professional sports leagues are also under pressure to make their sports safer. The National Football League (NFL) was sued by a group of more than 4,500 former players who claimed that the league concealed evidence on the dangers of repeated head trauma. This lawsuit was

portrayed in a recent documentary called *League of Denial*, which contained footage of California Senator Linda Sanchez speaking to Congress and saying, “*the NFL sort of reminds me of tobacco companies pre-90s, when they kept saying ‘No, there’s no link between smoking and damage to your health or ill effects’*” [4]. The media and legal issues that arose from the NFL lawsuit suggest it is time for other professional sports leagues such as the NHL to revisit their rules and policies regarding player safety and head injuries. Although professional athletes who compete in contact and collision sports inherently assume health risks, research has recently revealed the long-term consequences of players’ health are far more detrimental than originally believed [2, 3]. This paper will begin by reviewing empirical research on the physical, psychological, and socio-cultural factors of concussion injury and recovery.

Physical and Psychological Concussion Symptoms

Injuries occur frequently in elite levels of hockey where players can reach speeds up to 30 mph (48.3 km/h) [5]. Though concussion awareness has increased tremendously in recent years, there is no evidence to suggest the incidence rates have decreased at amateur and professional levels of hockey [1, 6]. Echlin and colleagues [1] found a concussion incidence of 21.5 per 1,000 athlete exposures in Canadian junior hockey, a developmental league for the NHL, which is a rate 3.3 times higher than what had previously been reported in the literature. Concussion research has also investigated NHL athletes due to the increased risks associated with participating in a fast-paced, aggressive sport at the most elite level in North America [2, 7–9]. Comparisons between studies reporting concussion incidence are contentious since different measurement scales have been used to report the injury [6]. As such, researchers have focused on reporting athletes’ symptoms. For example, Benson and colleagues [7] identified physical symptoms experienced by NHL athletes following a diagnosed concussion, which included headaches, dizziness, nausea, low energy or fatigue, and blurred vision. Although NHL players’ symptoms usually resolved within 13 days after their first concussion, the athletes experienced longer, more severe symptoms with each successive concussion [7].

Persistent physical concussion symptoms have been accompanied by psychological symptoms such as anxiety, isolation, depression, and even suicidal ideation [2,

10–14]. Chen and colleagues [10] determined that concussed individuals had similar neural responses in brain areas commonly linked with clinical depression. In their sample of professional athletes, Guskiewicz and colleagues [11] found those who suffered three or more concussions during their careers were three times more likely to be diagnosed with clinical depression compared to athletes with no history of concussion. Caron and colleagues [2] interviewed former NHL players who discussed the type and severity of their post-concussion psychological symptoms. Some of the athletes in their study contemplated suicide, a finding that has been reported anecdotally [15, 16] but rarely empirically.

While a concussion is commonly regarded as a functional brain injury, some experts have begun to link memory disorders such as dementia and behavioral detriments with a structural brain injury known as Chronic Traumatic Encephalopathy (CTE) [3, 17]. CTE was first diagnosed in boxers when Dr. Harrison Martland [18] noted there “*seems to be good evidence that some special brain injury due to their occupation exists*”. Research has found that athletes who competed in traditionally aggressive/violent sports, such as hockey, were at increased risk for incurring this neurodegenerative brain disease [17]. CTE is characterized by tau protein deposits in distinct areas of the brain, which are believed to accumulate over the course of repeated head trauma [3]. Though multiple/repeated concussive and subconcussive head impacts have yet to be conclusively linked to CTE [19], anecdotal and empirical evidence continues to accumulate [20]. CTE has gained notoriety primarily due to media attention and recent documentaries [4, 21], which highlight the premature deaths of former professional athletes whose autopsied brains revealed they suffered from neurodegeneration congruent with CTE [3].

Socio-Cultural Factors

In addition to investigating the symptomatology of concussive injury, researchers have also examined the influence of socio-cultural factors on athletes’ attitudes and behaviors towards pain and injury [22–25]. Coakley and Donnelly [22] noted that pain and injury tolerance were acceptable means for athletes to demonstrate toughness, strength, and commitment to their teams. Hockey players are culturally engrained to believe that injuries are “part of the game”, which may encourage

them to hide or not disclose injuries for fear of being stigmatized by their teammates as weak [24]. It may also explain why some athletes feel the need to hide or underreport concussion symptoms [2, 8, 26]. McGannon and colleagues [8] analyzed media narratives and found that NHL player Sidney Crosby accepted the risk of incurring concussions as a part of playing professional hockey. We believe these types of comments are misguided because the full extent of concussions is not yet understood [20]. Thus, while professional hockey players may accept that damage to their knees and shoulders are inherent occupational risk hazards, evidence suggests that concussions have far more serious long-term health implications [2, 11, 12, 17] and they should not be viewed as “part of the game”.

Researchers have also begun exploring other social aspects of concussions, such as the impact of recovery on spouses and other family members [2, 14, 27–31]. To date, this topic has received most attention with individuals who suffered a Traumatic Brain Injury (TBI). For example, Gan et al. [28] found family members experienced distress that included anxiety and loss of income while caring for individuals recovering from a TBI. Moreover, TBI researchers found that spouses experienced the most psychological stress of any family member, which included difficulty making decisions, as well as feeling isolated, alienated, and overwhelmed [28, 29, 31]. With respect to concussions and professional athletes, Caron and colleagues [2] found that retired NHL players felt they burdened their spouses during their concussion recovery because they were often incapacitated by their persistent concussion symptoms. Although TBI and concussion represent different injury constructs and the terms should not be used interchangeably [20], social (i.e., family) and cultural (i.e., masculinity) factors may impact concussive injury and recovery. As a result, professional sporting leagues must take appropriate action to educate athletes and their families on the implications of concussion injuries.

In sum, concussions have implications that affect professional hockey players and their families during and after their careers. Given that researchers are beginning to associate repeated concussive and subconcussive head trauma with CTE [17] and that awareness initiatives have had little impact reducing the incidence of concussions [1, 6], North American professional hockey leagues must begin to take measures to improve the health and safety of their athletes by implementing rule changes and by providing

comprehensive concussion education programs to athletes and their families. The importance and urgency of this suggestion has recently come to light due to a lawsuit by a group of former NHL players [32]. Among their claims, the players believe that the NHL contributed to a culture of violence in professional hockey by not banning fighting and body checking to the head. The remainder of this paper will outline recommendations for professional hockey leagues that are designed to make the game safer. Although these results are specific to professional hockey in North America, all professional sports leagues are responsible for creating a safe workplace environment that protects their employees from unnecessary risks and dangers. Executives from other professional leagues are encouraged to consider how our recommendations would affect the ethical obligations they have to enhance athlete health and safety in their sport.

Improving Player Health and Safety via Rule Changes

The notion of implementing rule changes to increase the safety of professional hockey players is not a novel concept. Like most professional sporting leagues, the NHL has altered its rules over time, including creating an instigator penalty for a player who starts a fight, as well as an automatic 10-game suspension for a player who leaves the team bench to engage in a fight. Despite the adoption of new rules by the NHL, evidence suggests they have had little effect on reducing concussion incidence [1, 6] and making hockey safer. As a result, we feel the NHL needs to add and modify rules to improve player safety, especially those aimed at preventing concussions. It should come as no surprise that some of our suggestions have been discussed and debated in various social media outlets. Furthermore, the recommendations presented in this paper should not be viewed as a criticism of on-ice officials. Rather, we hope these suggestions would give on-ice officials more power and authority to penalize players who behave in an unsafe manner.

1. **Change the membership of the Competition Committee.** The process of changing a rule in the NHL requires consensus from current players and league executives who are part of a Competition Committee. This committee forwards proposed rule

changes/amendments to the Board of Governors (i.e., team owners) and the NHL Player's Association for final approval [33]. While it is encouraging that both players and executives have input on the game's rules, we propose that concussion research specialists and practitioners who are *not* employed by NHL teams should be included on this committee, as well as former NHL players who have experienced concussions. One of the tasks of research specialists and practitioners could involve disseminating information to other committee members, which, in turn, might influence rule changes/amendments. For example, Hutchison, Comper, Meeuwisse, and Echemendia [34] analyzed video footage of NHL players who suffered diagnosed concussions over a 3-year time period. Among their findings, 32 % of concussions occurred when a defender was body checked while attempting to retrieve a puck in the defensive zone. Having research specialists and practitioners who are familiar with these results might help the NHL adopt a rule to improve player safety by limiting or removing an offensive players' ability to body check defenders during puck retrieval. In addition, former NHL players who have experienced several concussions [2] should also be included on the Competition Committee to document the severe effects of concussions. This may help encourage other members to design more stringent rules aimed at improving players' health and safety, particularly with respect to head injuries.

2. **Increase the width of North American ice surfaces.** The first indoor hockey game was played at Montreal's Victoria Skating Rink in 1875, where the ice surface was 204 ft (62.2 m) in length by 80 ft (24.4 m) in width. Given the increased size and speed of athletes in contemporary professional hockey, coupled with a shift in protective equipment that incorporates more hard plastics, metal, and rubber [35], it is surprising that the dimensions of North American hockey surfaces have remained virtually unchanged in 140 years. Hockey rinks worldwide continue to measure 200 ft (60.1 m) in length but there is a discrepancy in their widths. More specifically, North American ice hockey rinks are 85 ft (25.9 m) wide compared to International hockey surfaces that measure 100 ft (30.5 m) in width. We feel the width of North American rinks must be increased by a minimum of 15 ft (4.6 m) to

accommodate the increased size and strength of contemporary professional hockey players. Researchers have found that 88 % of recent concussions in the NHL resulted from contact between players [34]. In addition, some current NHL General Managers [36] have suggested increasing the width of North American ice surfaces as a way to improve player safety. In the short-term, redesigning every NHL rink would take time and would cost owners money to reconfigure them. In the long-term, removing premium seats that are closest to the ice surface would decrease their revenue. The monetary implications involved with this decision present a unique ethical dilemma for NHL owners.

3. **Increase penalties, suspensions, and fines.** Players who contact opponents' heads with body checks should be given lengthier suspensions and more expensive fines, and repeat offenders should be more severely punished, regardless of their intention. Currently, Rule 48 in the NHL addresses an illegal check to the head in the following manner:

"A hit resulting in contact with an opponent's head where the head is targeted and the principal point of contact is not permitted. However, in determining whether such a hit should have been permitted, the circumstances of the hit, including whether the opponent put himself in a vulnerable position immediately prior to or simultaneously with the hit or the head contact on an otherwise legal body check was avoidable, can be considered" [37].

A criticism of this rule is the amount of interpretation involved in the assessment of penalty and supplemental discipline (i.e., suspension). As well, the NHL is shifting some of the responsibility from the player initiating the body check to the recipient. We suggest the NHL consider rewriting rule 48 that would include more objective and severe guidelines for those individuals who deliver illegal checks to the head, especially for repeat offenders.

4. **Eliminate fighting.** An overdue, yet necessary rule change is the elimination of fighting in hockey. Ultimately, fighting does not directly contribute to scoring goals and winning hockey games. Sports media has often debated the usefulness and purpose of fighting in hockey [38], and some scientists have called for its abolishment [39–42]. Nevertheless, banning fighting in

professional hockey has been slow to gain momentum, although some hockey dignitaries have brought this issue to light [43]. Recently, former NHL All-Star and Hockey Hall of Fame member Ken Dryden noted, “*as contorted as the NHL’s arguments always are in terms of responding to concerns about fighting, I think they’re almost at the final point of contortion*” [38]. While elite junior leagues in North America have begun to remove fighting, the NHL has been hesitant to follow suit, perhaps because it is closely tied to the game’s history and on-ice altercations are perceived as entertaining for fans. Despite this, fighting rarely occurs in International (i.e., Olympic) hockey games, a fact that has seemingly not diminished the entertainment value of the sport at these competitions.

5. **Increase coach and owner accountability.** Recent attempts by the NHL to curb violent and aggressive acts via penalties, suspensions, and fines have not appeared to stop athletes from committing infractions that have caused head injuries. Therefore, we suggest that coaches and owners should be held more accountable for their players’ actions. There is precedent for this suggestion. Rule 46.22 fines coaches \$10,000 when one of their players instigates a fight during the final five minutes of a game. We believe that imposing similar, or perhaps even more severe sanctions on coaches and owners of players who commit head-related infractions would make players less likely to engage in reckless behavior because their actions would impact other members of their team and organization.

Improving Player Health and Safety via Concussion Education

In addition to rule changes, we argue that professional hockey leagues are ethically responsible for educating athletes, their spouses, and other family members about the implications of concussion injury and recovery. A brief overview of concussion education initiatives will be provided, followed by recommendations that are intended to increase concussion education for professional hockey players and their families.

North American Concussion Education Initiatives

Seventy-four percent of North Americans use the Internet on a daily basis [44], which means it has become a popular destination to access concussion information. One of the most popular concussion websites is ThinkFirst Canada, which is a non-profit organization dedicated to preventing brain and spinal cord injuries by educating youth, sports teams, and community volunteers about safety in sport. ThinkFirst created a video called Smart Hockey to educate youth coaches and athletes on concussion injuries. Cook, Cusimano, Tator, and Chipman [45] surveyed a group of 11–12 year old male hockey players’ concussion knowledge before and after watching the Smart Hockey video. The authors found that participants’ concussion knowledge was improved immediately after watching the video and that body checking-related penalties were reduced over the course of their season. Similarly, Cusimano, Chipman, Donnelly, and Hutchison [46] showed another sample of youth hockey players the Smart Hockey video and surveyed their pre- and post-video concussion knowledge. Although athletes’ concussion knowledge was improved immediately after watching the video, the authors did not find significant differences in the athletes’ concussion knowledge after 2 months. This suggests that exposure to concussion education videos does not necessarily translate to a long-term reduction in aggressive and violent behaviors on the ice [45–47]. Further, these findings suggest that concussion education would ideally involve multiple sessions and encompass more information on long-term physical and psychosocial implications of sport-related concussions.

The Sports Legacy Institute (SLI), a Boston-based non-profit organization, created an interactive concussion education presentation to improve students’ (ages 9–18) knowledge and understanding of concussion injuries [48]. The SLI concussion education program involves an interactive audio-visual presentation with students that included videos, demonstrations, case studies, and testimonials from athletes who experienced concussions. The presentation is approximately 60 min in length and emphasizes the “*recognition of signs and symptoms and appropriate responses after a concussion*” [48]. After giving the students identical pre- and post-presentation quizzes following the administration of the SLI program, the number of students who passed the quiz increased significantly, suggesting the program has positive short-term implications. Despite this, it is

unclear if concussion educative initiatives have lasting benefits for older, professional athletes.

Indeed, concussion education initiatives have rarely focused on professional athletes. The SLI recently partnered with Major League Lacrosse and proposed a concussion education program [49]. In addition to providing standard education on symptomatology and return to play protocols for athletes, the program intends to provide concussion caretakers (i.e., spouses) with strategies to help care for the athletes. Though the authors did not elaborate on *how* they would conduct this program or *what* it would entail, the inclusion of a professional sports league in a concussion education program is an important and novel concept, given that professional athletes are susceptible to downplaying or hiding possible concussion symptoms [2, 8, 26]. Suffice it to say, while it is encouraging to see this partnership developing, it is still in its formative stages and more standardized protocols need to be created so this type of program could be emulated by other professional sport leagues.

Based on some of the current education initiatives and available empirical literature, we are suggesting the following protocols for professional hockey:

1. **Educate current professional hockey players and their families.** In the past ten years, research has found that professional athletes who suffered multiple concussions during their professional careers suffered long-term physical and psychological impairment [2, 12]. Professional hockey players compete in more than 100 games each season, not including daily practices. They must navigate on a confined ice surface, which frequently involves high-speed contact and collisions and, potentially, on-ice altercations. For these reasons, professional hockey players must be educated on their occupation's unique dangers, including the increased risk of incurring short- and long-term impairment from concussions [2, 11, 12], as well as the injury's potential link to CTE [3, 17].

In addition to educating athletes, professional hockey leagues must also inform their families about long-term sequelae from brain injuries [2, 28, 29, 31]. North American concussion education programs [46, 47, 49] have primarily focused on youth athletes, have omitted the psychosocial aspects of concussion injury and recovery, and have rarely included family members. We argue that

professional hockey leagues are ethically responsible for providing comprehensive concussion education to athletes' families. This would include how to provide emotional (comfort and caring) and informational (advice, suggestions, guidance) social support [50] to improve family functioning during the athletes' recovery period.

2. **Change the medical protocol for concussed athletes.** Some sport ethics researchers have questioned whether coaches or team administrators knowingly or unknowingly pressured team doctors to return a player to play following a serious injury, such as a concussion [51–53]. Some coaches and owners may become consumed with winning games and generating revenue, and thus lose sight of issues like player health and safety. Taken together, the culture of professional sports has a number of stakeholders who have an effect on player health and safety. Due to the possible conflict of interest that can arise when an NHL team is paying the salary of its medical doctor [54], we recommend the NHL hire independent medical doctors to assess and diagnose every concussion injury. The team appointed medical doctor can still oversee the treatment and management of the concussed athlete, however an independent medical practitioner should be involved in the initial evaluation of athletes suspected of having a concussion and in granting athletes medical clearance to return to competition.
3. **Support research.** Since 2001, the Concussion in Sport (CIS) group has held four conferences [20] that have allowed primary care physicians, neurologists, neurosurgeons, neuropsychologists, and sports medicine doctors to determine the best practices for evaluation, management, and return to play following a sport-related concussion. Although the NHL was represented by the chair of their Concussion Working Group at the recent CIS conference in Zurich [20], professional sporting organizations appear hesitant to take a lead role at the CIS conference and others like it. We would like to see professional sports leagues like the NHL make substantive contributions to the academic concussion community. This could involve sponsoring research that would lead to rule changes and/or improved player health and well-being. Full support of concussion research in hockey is owed to the players and their families.

Conclusion

Researchers have found that rule changes are an effective way to help prevent concussions and other types of serious sports injuries [55, 56]. For example, professional rugby implemented a rule to alter the way players engaged in a ‘scrum’. Since the rule’s inception, there has been a reduction in the incidence of spinal injuries [57–59]. In a similar manner, we believe that rule changes could make professional hockey safer and reduce the incidence of concussions. The NHL’s marketing efforts have often highlighted the fast-paced, aggressive nature of the sport. Despite the unquestioned toughness of NHL players who regularly play through large amounts of pain [24], the short- and long-term health concerns surrounding concussions and head injuries can no longer be ignored. For example, a group of retired NHL players recently filed a lawsuit against the NHL claiming their health and well-being were compromised by the league who did not provide them with the proper care and guidance related to head injuries they sustained during their careers [32]. Taken together, we want professional hockey leagues like the NHL to understand their ethical obligations for players’ health and well-being and improve workplace safety by making changes to their sport, which includes reviewing and modifying its rules and increasing concussion education efforts for athletes and their families. We hope this paper will encourage multidisciplinary researchers to continue to discuss, debate, and disseminate this topic so that this great sport becomes safer at all levels of competition.

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