

CONCUSSIONS IN THE NHL: A CASE STUDY

William Beaver*

Robert Morris University, PA, USA

ABSTRACT

Concussions have become a major concern in professional sports particularly in the National Football League and the National Hockey League with most of the attention being directed at the NFL. With these thoughts in mind, this chapter will trace the actions taken by the NHL beginning in 1997 to the present. In some ways, the league was proactive in addressing concussion with the implementation of baseline neurological testing but was slow to implement other changes such as a formal concussion protocol. Comparisons are then be made with the NFL and conclude that the NHL did not engage in fraud and deception in terms of concussion research, but, on the other hand, conducted very little research on the subject. Finally, the article analyzes the league's concussions policies in terms of the NHL's culture and the structure of the league, which accounts for the conservative approach to reform.

INTRODUCTION

Concussions have become a major topic of interest in the sport's world particularly with the growing realization that concussions can have serious health implications, which can impact players long after they have left the game. Much of the attention has focused on the National Football League (NFL) where a best-selling book, *League of Denial*, and a major motion picture, *Concussion*, have directly confronted the issues surrounding head injuries in the league. More important, however, was the \$900 million settlement between the NFL and former players, which provides compensation for those who suffered long-term harm from concussions. Much less attention has been given to concussions in the National Hockey League (NHL), despite the fact that concussions are commonplace. Although there are more concussions in the NFL, the number in the NHL are such that the league has attempted to address the issue for nearly two decades.

The article will attempt to provide a clearer understanding of how the NHL approached concussions and is divided into three parts. The first part will chronicle how the NHL has attempted to deal with the issue beginning in 1997 and will trace the development of league policies. (See Table I). The second part will compare the policies of the NFL with the NHL. Finally, I will discuss the league's actions in terms of culture and structure.

* E-mail address: beaver@rmu.edu

Table I. Concussions in the NHL: Chronology of Events

1997	<ul style="list-style-type: none"> • Concussion Study Group formed and baseline neurological testing is implemented.
2000	<ul style="list-style-type: none"> • Injury Analysis Panel formed. • Eric Lindros sits-out 10 weeks to recover from a concussion.
2001	<ul style="list-style-type: none"> • Injury Analysis Panel makes first report and recommends covering exposed hard-shell plastic padding, the wearing of helmet visors, and the installation of more forgiving glass.
2003	<ul style="list-style-type: none"> • Independent study reports concussions are up in the NHL because more players are reporting them.
2004	<ul style="list-style-type: none"> • Injury Analysis Panel disbanded
2004-2005	<ul style="list-style-type: none"> • The league begins to crack down on vicious illegal hits imposing more suspensions and fines
2007	<ul style="list-style-type: none"> • Gary Bettman proposes penalizing all hits to the head if the initial contact point is the head but general managers reject the proposal.
2009	<ul style="list-style-type: none"> • Players' Association proposes penalties for recklessly or intentionally targeting the head. • Concussions Working Group proposes using helmet sensors to study concussions and investigate the long-term implications of concussions but is rejected
2010	<ul style="list-style-type: none"> • A formal protocol for concussions is adopted along with the approval of Rule 48.
2011	<ul style="list-style-type: none"> • Sidney Crosby suffers concussion and the concussion protocol is altered. • Three former NHL enforcers who had suffered concussions die.
2012	<ul style="list-style-type: none"> • Insurance industry expresses concern about growing number of concussions.
2013	<ul style="list-style-type: none"> • Former player's lawsuit is filed in U.S. District court. • Independent study finds Rule 48 has had little impact on the number of concussions. • The league institutes hybrid icing, the wearing of helmet visors, and penalizes players who remove helmets during fights.
2014	<ul style="list-style-type: none"> • NHL reports that 17 percent of concussions from illegal hits, 26 percent from accidental hits, and 44 percent from legal checks and a double-digit drop in concussions. • NHL reports the number of physical penalties has declined
2015	<ul style="list-style-type: none"> • Concussions spotters system implemented.
2016	<ul style="list-style-type: none"> • League reports that fighting down substantially over a five-year period. • U.S. District Court rejects NHL's motion to dismiss player's lawsuit and emails between NHL officials are released.

INITIAL ACTIONS

The simplest definition of a concussion is a blow to the head that alters brain functions, and hockey players have always known about them. For years they were often described as dings or “getting your bell rung,” but such hits to the head were usually not taken that seriously. Perhaps Brain Burke, now president of hockey operations for the Calgary Flames, best described how players handled concussions in the old days. “You went to the bench, threw-up, and as soon as you got your vision back you played” (Williams, 1996). Coaches favored players who could “suck it up” and still give it their best to help the team win. Indeed, players who exhibited such toughness were role models to be emulated. These values dominated the NHL’s culture from its inception but began to change during the 1990s. The NHL started to crack down on hits from behind but more telling was the 1995-96 season, where 52 head injuries were reported (a large number for that era), and two-thirds of these coming to the New York Islanders forcing the retirement of Brett Lindros who was only twenty at the time. Besides Lindros, star players from other teams, like Dave Taylor and Michel Goulet, were also forced into early retirement due to concussions (Elliott, 1996). In response, the NHL and the NHL Players’ Association formed a Concussion Study Group made up of team doctors, coaches, and trainers to improve understanding of the phenomena. As Chip Burke then Pittsburgh Penguins team physician put it, “We thought we should look at the problem and see what we could find out.” (Biggane, 1997) After reviewing the data and talking to experts for six months, Burke concluded that physicians could identify and treat the disorder, but other than that there was little scientific research available (Biggane, 1997).

The most important initiative taken by the NHL also occurred in 1997, when players were given baseline neurological tests during the pre-season so that if a head injury occurred a player could be tested again and not allowed to play until they returned to the baseline level. Although the new policy was a major advancement and unique to the NHL, no formal protocols were enacted. As Larry Pleau then the general manager of the St. Louis Blues put it, “There is no league formula to follow” (Nelson, 2000). Hence, teams treated concussions differently. For instance, the Blues required that a concussed player be free of headaches (the most common symptom) to begin light workouts on a stationary bike, followed by skating, and finally, a return to contact. Apparently, the Blues policy was driven by the fact that Pleau’s son had his hockey career cut short by concussions. On the other hand, Dallas Stars defenseman Richard Matvichuk was permitted to play in the 2000 playoffs with what was described as a “partial concussion” even though Matvichuk complained of headaches (Nelson 2000). Over the next several years, the league would require concussed players to be symptom-free as indicated by the Impact-2 test (developed by the NFL) and then have a team physician clear them for play (Gillooly 2007), but there was no formal protocol to cover the entire process, which was left up to each team.

The NHL also assembled a 20-person Injury Analysis Panel in 2000 consisting of coaches, team physicians, trainers, along with referees, and chaired by Dave Dryden, a former NHL goalie. The purpose of the panel was to gather objective data to prevent injuries. The panel took a cautious approach toward concussions. Dryden noted his group was “struggling” with the issue and stated “the worse thing to do with injuries is to move before you know all the details” (Todd, 2001). Similar comments would be echoed by league officials over the next decade. In 2001, the panel issued its first report. Among other things, they recommended

a reduction of deliberate blows to the head, the wearing of a new helmet every year with visors, covering exposed hard-shell plastic padding, and the installation of more forgiving glass to soften impacts from checks (NHL industry analysis panel, 2001). Only this last recommendation was acted on with any sense of urgency. New glass was installed behind the goal lines beginning in 2002 (Heike 2002). Some of the other recommendations would take some years to come to fruition. For instance, hard shell padding was required on elbow pads in 2003 but not until 2010 for shoulder pads, while helmet visors were not mandated until 2013. The panel also distributed a fact sheet and video to players about head injuries and established a hot-line for trainers to report concussions (Dryden 2001). The Injury Analysis Panel was disbanded in 2004 reportedly because the player's association feared information concerning a player's injuries would become known to management and influence contract negotiations or personnel decisions (Vogel 2016).

Although no new major policies regarding concussions would be forthcoming for some years, certain incidents did raise important issues. Eric Lindros, considered one of the league's best players had suffered a number of concussions in his career and was widely criticized for sitting-out 10 weeks to recover from one of them. Some implied that Lindros was a malingerer who violated the norms of the game, feeling he should return to the ice particularly during the 2000 playoffs, which he eventually did only to be concussed again (Leonard, 2016). Nonetheless, his behavior of sitting-out until recovered would become the standard in future years.

Another issue where the rules themselves, which seemed to precipitate head injuries. For instance, in 2002 Jeremy Roenick, then playing for the Philadelphia Flyers, blindsided Mike Madano of the Dallas Stars resulting in a concussion – the second such incident between the two players. Yet Roenick, although eventually suspended for the hit, did not receive a penalty for his actions. When the referee involved was later asked why, he responded that blood would have had to be drawn for a penalty to be called. For his part, Madano called for an end to all hits to the head, just as the NFL had outlawed spearing and clothesline tackles (Heika, 2002). Although not banning all targeted hits to the head, the league did begin to increase suspensions and fines for vicious illegal contact, particularly after the career ending hit by Todd Bertuzzi on Steve Moore in 2004 (Campbell 2005). In 2007, NHL commissioner Gary Bettman proposed penalizing any hit to the head if the initial contact point was the head at a general manager's meeting. Only one general manager voted in favor of the proposal, although league officials would continue to promote the idea (Agenda: NHL general managers meeting).

Perhaps one of the reasons for a lack of new reforms was a study published in the *Canadian Journal of Neurological Sciences* in 2003. The study found that concussions had tripled between the 1986-87 and 2001-2002 seasons with a particularly sharp increase after the 1997-98 season. Some hypothesized that players had gotten bigger, hence more violent and damaging hits. However, the study concluded that more awareness and reporting of concussions was the major cause, not larger players. "It's becoming much less of a macho thing" stated Dr. Richard Wennberg one of the authors of the study in referring to the slowly changing league norms (Wennberg & Tator, 2003). The findings could also be interpreted as evidence that the league's policies requiring baseline testing were working and further changes were unnecessary.

One of the more curious aspects of the concussion issue was the study group formed in 1997 produced so little research, although apparently the data existed to do so. Emails

between the NHL's deputy council Julie Grand and Gary Bettman indicate the lack of research was troubling. Grand felt the primary reason was the group was not paid, along with a lack of leadership. In 2007, a new entity the "Concussions Working Group" was formed (Westhead 2016). In 2011, an article was finally published which focused on the 1997-2004 regular seasons. Among other things, the article reported that headaches were the most common symptom of concussions and games missed due to them had increased (Benson et al., 2011). In 2009, the group (currently called the Concussion Subcommittee) wanted to begin a pilot program where selected teams would wear helmet sensors to measure the magnitude of blows to the head. If a player received a hit beyond a certain threshold, they would be removed from the ice and medically evaluated. The group also wanted to conduct a study of retired players who had suffered repeated concussions to determine if there were any long-term health implications. In an email, Julie Grand wrote that helmet sensors would be "too expensive". As for the study of retired players, Grand wrote, "We don't think anything can be gained that would benefit our game" (Grand, 2009).

A FORMAL PROTOCOL AND RULE 48

In March 2009, the NHL Players' Association head Paul Kelly, during the league's general managers meeting, announced that referees should have the option of calling penalties on players who intentionally or recklessly target the head of an opponent. Kelly stated that perhaps three-quarters of the players favored the rule change. However, accidental or inadvertent hits should not be penalized since they "don't cause a great deal of injury" according to Kelly—a puzzling statement given the fact any hit to the head, accidental or otherwise, can result in an injury (NHL Players' Association urges GMs to consider penalizing hits to head, 2009)

The union's support of new rules to protect players marked something of a turning point in that another important NHL constituency, along with the league's brass favored change. At the same time, external forces were also at work. League documents indicate the NHL felt it was being targeted and blamed for concussions triggered by the fact that more players were sitting out for longer periods, which many viewed as a positive development. In addition, the NFL's concussion issues had generated a great deal of publicity and focused unwanted attention on the NHL (Executive Summary, 2010). The end result being the league's general managers finally acquiesced, which brought about two important changes. In January 2010, the NHL announced the implementation of a formal concussion protocol developed by the Concussion Working Group. The protocol required that if there was an incident on the ice, a trainer on the bench would make an initial evaluation. If the trainer deemed there was a problem, the player would be taken to an isolated area where a team physician would administer the Sport Concussion Assessment Tool or Scat-2. During the test, players are asked to perform simple motor skills like standing on one leg and then asked a number of questions such as, who hit you, and then repeat four numbers spoken by the physician in reverse order, something a non-concussed player should be able to do. Following the exam, which takes 10 to 15 minutes, the physician would make an initial diagnosis. If a concussion was diagnosed, the player would sit out until they were symptom-free, and a team doctor cleared their return (NHL protocol for concussion evaluation and management, 2010).

The other major change involved rule 48 and was based on the league's Concussion Video Analysis Project. The new rule stated that lateral or blindside hits where the head is the primary target are illegal and would result in a major penalty. Apparently, there was some confusion about what constituted a blindside or lateral hit. As a result, the following year the rule was modified. The words lateral and blindside were removed so that any hit to the head, where the head was the primary target would be penalized. Brandon Shanahan, then senior vice-president of the NHL, also announced that players would also be subject to "supplemental discipline" (usually a suspension and or a fine) even if a penalty was not called during the game. (Rosen, 2011). This would be accomplished through the Department of Player Safety, who would video monitor all games for violations. (Department of player safety, 2011) In 2013, the rule was changed once again. The new wording stated that an illegal hit occurred when the head was the main point of contact and such contact was avoidable. It should be emphasized that not all hits to the head were illegal. For instance, no penalty would be called if contact was deemed to be accidental or where contact had been initiated squarely through the body and the head not targeted. In addition, if a player put themselves in a vulnerable position or changed positions just prior to contact, a penalty would not be assessed (Brigidi, 2013).

An independent analysis of rule 48 revealed it had little impact on the number of concussions. The study, after examining three seasons (2010 through 2012), found that 28 percent of the "interactions" that generated a concussion resulted in a penalty, but blindsiding occurred in only 4 percent of the cases, which rule 48 explicitly addressed. The authors of the study also felt that allowing referees to make judgement calls regarding players putting themselves in vulnerable position, should be reevaluated (Donaldson et al., 2013). While not directly addressing this issue, Gary Bettman pointed out that many concussions occurred because of accidental or inadvertent contact, where teammates collide or when a player is checked legally but then hits his head on the ice or boards and not because players were intentionally targeting the head. The commissioner went on to add "It's easy to say the league needs to do X, Y and Z on concussions. It's not that simple." Bettman also implied that it was important to take a cautious approach. As he put it, "Changing a rule which doesn't address what's actually causing the concussions may not be the right thing to do. Changing equipment may not necessarily be the right thing to do" (Frequently asked questions about concussions, 2011).

THE CROSBY CONCUSSION

On January 1, 2011 the "Winter Classic" was held outdoors at Pittsburgh's Heinz Field between the Washington Capitals and the Penguins. During the game, Sydney Crosby, considered the league's best player, was hit in the head from behind. The hit was ruled accidental and no penalty was called, and Crosby, although dazed, played the rest of the game. After the game, Crosby spoke with the media and seemed to be alright. Four days later Crosby played in the team's next game and was checked heavily into the boards. He left the game and was subsequently diagnosed with a concussion. Crosby would take the next 15 months to recover. Pat Lafontaine, a Hall of Fame player, who was driven from the game by concussions gave his take on the Crosby situation when he told *The USA Today*, "He wasn't healed from the first one and that's why the damage was greater from the second one. When

you get hit again after a short period of time after you've been concussed, that's where the exponential damage comes in" (Alan & Brady, 2011). Shortly after the Crosby incident, the Concussions Working Group modified the concussion protocol, which was quickly implemented in March 2011. There would no longer be a bench evaluation if a concussion was suspected. Instead, the player would be immediately be taken to a "quiet room" for evaluation by a team doctor. Although the league denied Crosby's concussions had anything to do with the change, the timing suggests otherwise. Had Crosby been immediately removed from the ice and evaluated after the first incident, his recovery might have been more rapid, as recent research indicates (Peachman, 2016). To some, including Lafontaine, former Philadelphia Flyer Keith Primeau (an often-concussed player) and then Capital's coach Bruce Bourdeau the change was not enough. As Bourdeau put it, "You're never going to take the hitting out of hockey. But at some point the hitting to the head has got to stop" (Alan & Brady, 2011). One could also add Bourdeau's comments were particularly appropriate in regard to star players whose extended absence could harm the entire league.

FIGHTING AND ECONOMIC ISSUES

Besides the Crosby incident, one other event brought concussions to the forefront in 2011. Three former league enforcers (fighters), Derek Boogaard, Rick Rypien, and Wade Belek all died either by an accidental overdose of drugs or suicide and all had suffered concussions (Branch, 2016). The NHL is the only major professional sport where trading bare-knuckle punches is viewed as a normal part of the game and a behavior for which players are not ejected. The tragic deaths of the three players would raise new questions. Are players who regularly fight more prone to concussions? Were the deaths of these players somehow linked to concussions and are there long-term health implications? Questions the league would be forced to grapple with in the years to come. A recent analysis did shed some light on the subject finding that 8 percent of concussions were the result of fighting and 75 percent of these were caused by the player's head hitting the ice (Kuhn & Solomon, 2015).

The official position of the league was that the effects of fighting and the long-term health implications of concussions were unclear. However, in March 2016 the U.S. District Court in Minneapolis ordered the release of emails between league officials, which appeared to contradict the official position. For instance, deputy commissioner Bill Daly wrote, "Fighting raises the incidence of head injuries/concussions, which raises the incidence of depression onset, which raises the risk of personal tragedies." There were also emails between Daly, Bettman, and Shanahan, which discussed outlawing fighting. However, Bettman felt that the NHL Players' Association would block any moves to ban fighting since it would eliminate jobs for enforcers (Branch, 2016). NHL officials maintained that part of the problem with implementing new rules was the players' association. According to the collective bargaining agreement between the league and the union, proposed rule changes are made by the NHL's Competition Committee and then approved by the league's Board of Governors. Five members of the Competition Committee are current players chosen by the players' association, the other five are selected by the league. Seven votes are required for a rule change to be recommended, which obviously gives the union a major voice in any rule changes (Competition Committee, 2015).

There were also economic pressures to confront the concussion issue. Air Canada reportedly informed the NHL that it was considering withdrawing its financial support if more was not done to combat concussions (Concussions: New rules for treating NHL players, 2011). The league also requires teams to take out insurance policies which covers 80 percent of a team's top five player salaries if they are injured for extended periods. With the growing number of reported concussions and players sitting out longer, the risk to insurance companies increased. As one insurance executive put it in 2012, "Right now you've got 10 percent of the league affected by concussions. While I don't know where the breaking point is, at some point, if it keeps trending this way, companies are not going to be able to insure the NHL players for concussions." The executive went on to say, "The entire framework of the NHL is in jeopardy. There is a risk of bringing down the house" (Westhead, 2012). In addition, a study released in 2014 found injuries cost the league \$200 million a year, with head and neck injuries costing \$60 million a year and accounted for missed games than any other type of injury (Brean, 2014). The study highlights the on-going dilemma the NHL faced--injuries were expensive but would making the game less physical be ultimately more expensive due to reduced fan interest and revenues?

That said, the league would continue to make minor changes. For instance, more padding would be added along the boards, while other improvements were made to the glass surrounding the ice. In 2013, players were finally required to wear helmet visors, while players who removed their helmets during fights would be penalized. Hybrid icing was also introduced, which meant icing would automatically be called rather than have players race back for the puck, where violent contact often occurred (Rosen, 2013). In addition, both the players' association and the league ramped-up efforts to educate coaches, players, and staff about head injuries (Memorandum: Concussions program update, 2012). Gary Bettman stressed that players had to take responsibility and follow the concussion protocol for the system to work. In this regard, various news accounts indicated that players were able to skirt the system. In 2014, James Wisniewski, a defenseman with the Columbus Blue Jackets, told reporters that he avoided the protocol after he went head first into the boards. In another incident, Montreal forward Mike Weise was blindsided during a 2014 playoff game. He went to the dressing room but returned to the ice. The following day, the Montreal's general manager Marc Bergevin said that the protocol had been followed, and the team did not know Weise had a concussion. These two incidents are indicative of an on-going problem. First, marginal or journeyman players are more likely to attempt to avoid the system for fear that if diagnosed with a concussion and forced to sit-out, someone will replace them. Secondly, the urgency of the situation can play a role. Specifically, if it's a crucial regular season game or the playoffs, with a lot at stake, the system is more likely to be compromised by players or team officials (NHL still grappling with concussions, 2014). In an attempt to mitigate such occurrences, the NHL introduced a "spotter system," borrowed from the NFL in 2015. During each game, an NHL official with access to live streaming and video replay watches for visible signs of a concussion and then notifies the appropriate bench. The player in question is then taken off the ice and formally evaluated. Of course, the judgement of the spotter is paramount and spotters have been maligned for missing what some thought were obvious visible signs (Enger, 2015). Perhaps this is why the NHL will now have 4 concussion spotters at a remote location as well as those on-site, and all will have authority to remove players for the game (Clinton, 2016).

IMPACTS

What has been the impacts of the league's various initiatives to reduce concussions? A review of the literature by Kuhn and Solomon (2015) discovered that between 1986 and 2012 the rate of concussions increased. The lowest number occurred in 1986-87 season (.417 concussions/100 games) and the highest number in the 2011-12 season (4.8 concussions /100 games), while 88 percent of the concussions were related to a violent act. However, the reasons for the increases were not more violent or larger players, but, once again, increased awareness and reporting. In 2014, the NHL stated only 17 percent of concussions were from illegal hits, 26 percent from accidental ones, and 44 percent were from legal checks (Stimson, 2015). In a related issue, the number of fights declined from 645 in the 2010-11 season to 317 as of March 2016, while the number of so-called "physical penalties" assessed per game declined from 1.34 to 1.03 over a five-year period (Goss, 2016). There was also a double-digit drop in concussions to 53 for the 2013-14 season, compared to the 2011-12 (the last full season before the players were locked out), where the number was 78 (NHL still grappling with concussions, 2014). Critics questioned the double-digit decline, suggesting there may have been less reporting by players or teams in any given season, which may be directly tied to the fact that the NHL does not require teams to disclose the specific nature of an injury. Hence, concussions can be reported as an "upper body injury" making accurate assessments difficult (Stinson, 2015).

THE PLAYERS' LAWSUIT

Much of the discussion about concussions was heightened by a lawsuit filed in November 2013 by 10 former NHL players in U.S. District Court. In a nutshell, the suit alleges the league knew or should have known about the dangers concussions posed, and as result, failed to do enough to reduce the risks involved and educate players about them. The suit seeks medical care for those requiring it and "the full measure of damages" allowed under the law. The suit did not specify any dollar amounts, nor was there any mention of the players' association. Since the initial filing, more than 100 players have joined the class action lawsuit, which is open to all 4300 players who retired before February 2013 and suffered brain trauma and or injuries that were caused by concussions or sub-concussive contact (Mcindoe, 2013). The NHL filed a motion to dismiss the suit, arguing that any claims by former players are preempted by labor law, in this case, contractual agreements reached between the league and the players' association. However, in May 2016 a U.S. District Judge in Minneapolis ruled against the motion allowing the player's lawyers to proceed with the discovery phase of the suit, which precipitated the release of 298 emails between league officials. The league responded by declaring it would defend the suit "vigorously" (Heitner, 2016).

COMPARISONS WITH THE NFL

Any discussion of the NHL's concussion policy will inevitably lead to comparisons with the NFL. In this regard, both leagues formed committees to study concussions. In 1994, the NFL announced the formation of the "Mild Traumatic Brain Injury Committee." (MTBI) This

committee, much like the NHL's concussion study group, was largely made up of individuals with ties to each league, making them vulnerable to the charge that independent voices were lacking, but that is where similarities end. The most obvious difference was in the amount of research published. The NHL group published very little, while the opposite was true of the MTBI. Beginning in 2003, the committee would publish 13 peer-reviewed research reports appearing in the journal *Neurosurgery*. The reports were based on data gathered from team doctors between 1996 and 2001. In general, the research supported the NFL's contention that concussions are not associated with long-term harm. A 2005 report claimed, "Return to play does not involve a significant risk of a second injury either in the game or during the season" (Petchesky, 2013). In the meantime, independent research increasingly contradicted the MTBI. For example, a survey of NFL retirees with a history of concussions found they were 5 times more likely to suffer cognitive impairment, while an earlier study discovered that if players had multiple concussions the chance of developing depression later in life doubled (Faibaru-Wada & Fainar 2013). A more recent investigation by the *New York Times* revealed 100 diagnosed concussions were not reported to the MTBI since teams were not required to participate in the study. The result being that concussions appeared to be less frequent than they actually were. In addition, some of the reviewers for *Neurosurgery* had strong reservations about the validity of the studies but had little impact on the decision to publish (Schwarz et al., 2016). By 2010, the MTBI was discredited to the point that its two co-chairs resigned, and the committee was disbanded and was replaced by the Head, Neck, and Spine Committee. In speaking about the MTBI one of the co-chairs of the new committee stated, "We all had issues with some of the methodologies... the inherent conflict of interest ...that was not acceptable by any modern standards or not acceptable to us" (Petchesky, 2013). Others likened the NFL to the tobacco industry where for years bogus studies were used to cover-up the harmful effects of smoking (Schwarz et al., 2016).

Certainly, publishing very little is better than publishing research that would later be discredited and not many have equated the NHL with big tobacco. Nonetheless, there are questions that arise. First, did the NHL know more about the potentially harmful effects of concussions than were revealed? At this point, this does not appear to be the case. Although emails indicate that league officials felt concussions could produce long-term harm, the NHL did not conduct any studies in this regard, and when the Concussions Working Group proposed doing so, they were turned down, which suggests the league's position was "what we don't know can't hurt us." One can also wonder to what degree was the NHL influenced by the NFL's MTBI reports, which downplayed the seriousness of concussions?

An area where the NHL was proactive was the implementation of baseline neurological testing, beginning in 1997. In contrast, the NFL did not mandate baseline testing until 2008. Interestingly, when the NHL implemented its program, Elliot Pellman, then team physician for the New York Jets, and a much-maligned co-chair of the MTBI, stated he tried to initiate a similar program early on, but only 6 to 10 teams showed any interest (Biggane 1997). As discussed, the NHL implemented its formal protocol in 2010 and the NFL in 2011, although beginning in 2009 the NFL placed posters in locker rooms warning players about the dangers of concussions (Coates, 2013), and the majority of teams were voluntarily following a protocol. The formal protocols of each league are similar: a player is removed from the ice or field and taken to the dressing room for evaluation. One important difference is before a player returns from a concussion in the NFL an independent neurologist, and not a team

physician must approve a player's return, removing any pressure on team doctors to clear a player before they are recovered (NFL's 2013 protocol for players with concussions, 2013).

In 2009, the NFL publicly admitted for the first time a connection existed between head trauma and lasting injury when league spokesperson Greg Aiello stated, "It's quite obvious from the medical research that's been done that concussions can lead to long-term problems" (Coates, 2013). For its part, the NHL has never made any such public statements, maintaining there is no clear link between the two. Moreover, in March 2016 an NFL official admitted a connection between developing chronic traumatic encephalopathy (CTE), the degenerative brain disease and concussions. Gary Bettman then attempted to distance the NHL from the NFL. He told reporters, "It's fairly clear that playing hockey isn't the same as playing football", then added, "and as we've said all along, we're not going to get into a public debate about this." (Kilgore 2016). Bettman's statement is, to say the least, curious. There are obvious differences between the two sports, but the NHL is the only other professional league which comes close to the NFL in terms of physical contact and head injuries, and although there is no conclusive link between playing hockey and developing CTE, experts on the subject believe that once more brains of deceased NHL players are examined a link will be established (Kilgore, 2016). Perhaps the commissioner's comments should be viewed in the context of the player's lawsuit where any public admission would be viewed as detrimental to the league's financial interest while the suit proceeds.

DISCUSSION

Beginning in the 1990s, the NHL began to take concussions more seriously as its culture began to slowly change. The initial actions, like baseline neurological testing, appeared to be prompted not by external forces, which would come later, but with the realization that star players, the league's most valuable commodity, could have their careers shortened and would be an important and on-going contingency. Over the years, a policy evolved that aimed to protect players without changing the fundamental nature of the game, which proved to be a difficult balancing act. As discussed, by 2007 league officials wanted to penalize all direct hits to the head but the teams, general managers nixed the idea. Although one can only speculate as to why, since the minutes of the general managers meeting in the released emails have been redacted, two possible reasons come to mind. First, further limitations on the more physical play would hurt certain teams who specialize in being aggressive. Second, hitting was an essential component of the NHL's culture and limiting it might change the game, to the point that it would diminish the sport's popularity and ultimately revenues. These values were expressed by Mike Murphy, former player and NHL executive in an email to Gary Bettman when he wrote in regard to a less physical play, "We run the risk of having a totally different game than we have now... Less physical, less combative etc. One we probably wouldn't like" (Murphy 2008).

The same values were also embraced by the players' association. Why it took until 2009 for the union to recommend that intentional hits to the head should be penalized is puzzling. Certainly, protecting players from career ending injuries and lasting harm should be of paramount concern for a union. Did the players also fear that new rules would change the nature of the sport and negatively impact their careers? There are any number of players who stay in the league because of their physical play, perhaps that's why surveys over the years

have found that players did not want fighting eliminated (Wyshynski, 2012). As mentioned, NHL officials indicated in their emails that the players' association would oppose the elimination of fighting because it would eliminate jobs for enforcers. Apparently, the union felt a sense of loyalty to players who had been groomed in junior hockey and the minor leagues to fight and who otherwise did not possess the skills needed to remain in the league.

In a 2013 interview, Gary Bettman stated the NHL had undergone a cultural change. He noted the implementation and modification of rule 48, equipment changes, the formal concussion protocol, along with more players willing to report suspected concussions (Duhatschek, 2013). One could also add the decline of fighting and the diminished role of enforcers to the point that many teams do not employ one. The decline in fighting is intriguing since the NHL has never banned it. Perhaps the best explanation is the tragic deaths of Boogaard, Rypien, and Belek and negative publicity generated had as much to do with it as anything (Kelly, 2016). The fact that fighting is still a part of the NHL's game points to another important variable in understanding the concussion issue—the structure of the league.

The NHL has three prominent stakeholder groups, league officials, the teams (typically represented by the general managers), and the players' association. For any meaningful change to occur, there must be some consensus, and in terms of fighting, none of the three groups have favored banning it, despite the fact that it might improve the league's image. On the other hand, the addition of rule 48 illustrates how consensus is needed to effectuate change. League officials first proposed changes in 2007, followed by the players' association in 2009, and finally the general managers in 2010. All nudged along by growing social pressures to do something about concussions, spurred in part by the NFL's difficulties.

The interplay of culture and structure in the NHL lends itself to what some have called a glacial approach to reform. That said, one wonders if other reforms will eventually be approved. Besides eliminating fighting, the league could penalize any hit to the head, accidental or otherwise. Indeed, Montreal Canadiens owner Geoff Molson, fearing lawsuits, proposed such a rule change in 2011 (Vogel, 2016). Other organizations, including the International Ice Hockey Federation, the Ontario Hockey (OHL), and NCAA Hockey, have all done so. Perhaps at some point, the NHL will follow suit, but as yet there appears to be no consensus on the issue, even among the players. Skilled players tend to favor the change, while the more physical players are opposed. Not surprisingly, they argue that penalizing all head contact would take away the hitting and physicality that epitomizes NHL (Klien, 2011). Another element that should be pursued is safer equipment, particularly helmets. The NFL's experience with developing a safer helmet has been frustrating but research needs to continue. In this regard, the NHL does have a protective equipment subcommittee, which should investigate the helmet issue more vigorously. Finally, two minor changes could add some credibility. First, the league needs to be more transparent and require teams to report concussions, rather than "upper body injuries," and second, an independent physician (not team doctors) should clear a player's return to the ice like the NFL.

CONCLUSION

Gary Bettman has stated that concussions are a complex issue, and there is no "magic bullet" for reducing them, which the research supports—witness rule 48. The NHL was not unmindful of the problems associated with concussions, and made reforms, and to this point,

has also avoided the scandal experienced by the NFL. On the other hand, additional changes could have been put into place like penalizing all blows to the head and eliminating fighting, which could further protect players but no consensus exists to do so. In addition, the fact that NHL officials have never made any public statements concerning the dangers of concussions is troubling to say nothing of the paucity of research produced by its own committees. The most important element, however, in the league's conservative approach, appears to be the fear that if the culture of the NHL was changed too much, its popularity and revenues would decline. There is no doubt that fans are drawn to the violence of hockey. Yet, fighting is down significantly in the past few years, and the role of enforcers diminished, neither of which have appeared to have any impact on the NHL's popularity or revenues and suggests that other reforms will not lead to hockey's demise. In this regard, it will be interesting to see if more changes are eventually implemented in future years and how the outcome of the player's lawsuit impacts the league.

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