Concussion in youth ice hockey: It’s time to break the cycle

L. Syd M. Johnson MA PhD


Pittsburgh Penguins captain Sidney Crosby suffered a hard blow to the head in a blind-side collision during the 2011 Winter Classic hockey game. He crashed to the ice, staggered to his feet and slowly left the rink. In a game a few days later, Crosby was slammed against the boards, fell to the ice and exited the game. He’s been sidelined indefinitely with a concussion and, according to the concussion protocols of the National Hockey League (NHL), can’t return to the game until he’s free of symptoms.

Crosby has a lot of company in the NHL, where the number of concussions doubled in the 2010/11 season. The NHL commissioner attributes the increase in concussions to accidental hits: players being struck by pucks, colliding with teammates, or striking the ice or the boards after being hit legally. The fact is that the vast majority of concussions, and hockey injuries overall, at all levels of play, are caused by legal bodychecking.

Concussion in youth ice hockey

The NHL’s problem with concussions is just the tip of the iceberg; concussion is all too common in youth ice hockey, with evidence that, despite educational efforts, the number of concussions continues to be substantially under-reported. A study published in late 2010 found an alarming rate of concussions in junior hockey. In the prospective study, which involved two teams of hockey players aged 16–21 years, 17 of 67 players sustained a concussion during a single season, with five of those players also suffering a second concussion. That is, 25.3% of players sustained at least one concussion in a single season, a rate of concussion seven times higher than the highest rate previously reported in the literature.

An estimated half-million youths play organized minor ice hockey in Canada. The pediatric population is known to be more vulnerable to concussion and to experience more serious short- and long-term symptoms of concussion than adults. Youth athletes with concussion may experience fatigue, inattention, lack of concentration, memory loss and headaches, which can have devastating effects on both athletic and academic performance. Subtle cognitive deficits may persist for up to a year in some youths. Youth athletes who sustain minor brain trauma are also at risk for so-called second-impact syndrome, a rare but catastrophic neurologic condition that is almost always fatal. A history of concussion results in substantially increased susceptibility to additional concussions and more severe symptoms of concussion.

Repeat concussions are also a risk factor for chronic traumatic encephalopathy (CTE), which is associated with a spectrum of sequelae including memory loss, behavioural and personality changes, depression, early dementia and motor neuron disease. In one-half of the confirmed instances of CTE in athletes, symptoms developed within four years of the athletes stopping play. Subconcussion impacts of the kind common in contact and collision sports, such as hockey and tackle football, are also implicated in CTE. The deposition of tau proteins indica-

KEY POINTS

- Concussion is a common, serious injury in youth ice hockey, affecting up to 25% of players per season by one estimate.
- Bodychecking is a major cause of injury and concussion in hockey, yet some Canadian provinces allow players as young as nine years to engage in bodychecking.
- Reducing rates of concussion requires eliminating bodychecking for all except elite hockey players aged 16 years and older, as per the recommendations of the Canadian Academy of Sports and Exercise Medicine.

© 2011 Canadian Medical Association or its licensors
tive of CTE have been found on autopsy in the brains of American football players with no history of concussion, as well as athletes as young as 18 years old.20 Concussion causes detectable but subtle symptoms and can be diagnosed by properly trained and vigilant physicians, trainers and coaches, but subconcussion impacts cause silent, invisible, lifelong damage to the brains of youth athletes.

The role of bodychecking

Bodychecking is a major cause of serious injury, including concussion, in hockey players.4,21,22 The American Academy of Pediatrics recommends that bodychecking be prohibited for children younger than 15 years.23 Among the reasons cited by the academy is that there can be pronounced variations in body size, physical maturity and strength among players in younger age groups, resulting in heightened risk to smaller players who are matched against much larger players in the same age bracket.23

Bodychecking in minor hockey introduces substantial risks of serious injury, including the risk of concussion and lasting brain damage.

The more conservative recommendation of the Canadian Academy of Sports and Exercise Medicine calls for bodychecking to be eliminated from all levels of minor hockey “which are not designed as training for professional and international ranks,” and only beginning in elite Rep or All Star leagues in the 16- to 17-year (Midget level) age group.24 Hockey Canada, the governing body of minor hockey, allows bodychecking at the Pee wee level (ages 12–13) and above for male players; the Saskatchewan, Ontario and Ottawa hockey leagues permit bodychecking at the Atom level (ages 9–10) on an experimental basis. Quebec permits bodychecking at the Bantam level (ages 14–15).25 Quebec is the only province in Canada that has seen growth, rather than decline, in the number of children playing minor hockey, a trend that has been attributed in part to the late introduction of bodychecking.26

Hockey Canada’s position is that checking skills are critical to the game of hockey and that “players must learn and master all aspects of the checking game to become effective and complete players.”25 A 2004 study sponsored by the Canadian Hockey Association (now Hockey Canada) concluded that bodychecking “can be taught at the younger age levels in a manner that does not lead to a higher incidence of injuries.”27 Several studies have confirmed, however, that injury rates rise dramatically when bodychecking is introduced.4,21,28 that players typically sustain their first concussion within a year of starting bodychecking7 and that education in “proper” bodychecking technique does not reduce rates of injury.6 The evidence strongly suggests that substantial harm may result from teaching youth players bodychecking at an earlier age.5,24

USA Hockey, the governing body for minor hockey in the United States, permits bodychecking at the Pee wee level (ages 11–12), but is currently considering a rule change to raise the age to the Bantam level (ages 13–14), based on a recommendation by the USA Hockey Player Development Sub-committee on Body Checking.7 The proposed change is motivated by two factors. First, skill development is hindered when bodychecking is introduced, because players focus on hitting and avoiding being hit rather than on skating, puck- and stick-handling, receiving, shooting and other hockey skills.7 The subcommittee argues that players will benefit from two more years of skill development, unhindered by bodychecking.29 This is in contrast to Hockey Canada’s assertion that training in bodychecking benefits player development.25 Second, the US subcommittee cited concerns about player safety, noting a threefold increase in game-related injuries, “including concussion, severe injury and severe concussion,” among players aged 11–12 years following the introduction of bodychecking.8,29

The increased incidence of serious injuries related to bodychecking has also been observed in other countries where bodychecking is not permitted for younger players.7,28 In Finland, Mölsä and coauthors observed a disproportionate increase in injuries related to bodychecking, compared with other mechanisms of injury, in the age group for which bodychecking is first introduced.7 Additionally, bodychecking was found to be the dominant mechanism of injury in older groups.7

The way forward

Rates of concussion in hockey are among the highest in all contact sports.4,30 There is considerable evidence to support the conclusion that to substantially reduce the number of concussions and subconcussion impacts in junior hockey would require a comprehensive set of changes to how minor hockey is played, including the elimination of bodychecking.4,5,21,24,28 The recommen-
The way hockey is played by the professionals is imitated in junior hockey. This creates a vicious cycle in which young athletes learn to play in a way that inevitably causes injury and in turn influence the next generation of players. It’s time to break that cycle and teach youths to play in a way that emphasizes skill and protects their brains, so they’ll be prepared to do the same when they grow up. There are a lot of kids who want to be the next Sidney Crosby, but they ought to be able to play the sport they love without being the next hockey player with a concussion.

References


Affiliation: From Novel Tech Ethics, Dalhousie University, Halifax, NS

Funding: Research funded by Canadian Institutes of Health Research, MOP 77670, Therapeutic Hopes and Ethical Concerns: Clinical research in the neurosciences, and NNF 80045, States of Mind: Emerging issues in neuroethics.

Acknowledgements: The author thanks anonymous reviewers who provided valuable and informative feedback on this paper.