

Body-Checking Rules and Childhood Injuries in Ice Hockey

Alison Macpherson, PhD^{a,b}, Linda Rothman, BScOT, MHSc^{c,d}, Andrew Howard, MD, MSc, FRCSC^{c,d}

^aSchool of Kinesiology and Health Science, York University, Toronto, Ontario, Canada; ^bInstitute for Clinical Evaluative Sciences, Toronto, Ontario, Canada; ^cPopulation Health Sciences and ^dDivision of Orthopaedic Surgery, Hospital for Sick Children, Toronto, Ontario, Canada

The authors have indicated they have no financial relationships relevant to this article to disclose.

ABSTRACT

BACKGROUND. Body checking is the predominant mechanism of youth ice hockey injuries. The Canadian Hockey Association has allowed body checking from ages 12 to 13 (peewee level) and up. One Canadian province (Ontario) introduced body checking at ages 10 to 11 (atom level) in the competitive leagues, whereas in Quebec body checking has only been allowed at ages 14 to 15 (bantam Level). The purpose of this study was to compare body-checking injuries, fractures, and concussions in boys' minor hockey between jurisdictions in which checking is allowed and jurisdictions in which body checking is not allowed.

METHODS. Data from the Canadian Hospitals Injury Reporting and Prevention Program (CHIRPP) were used to characterize children's ice hockey injuries from September 1995 to the end of August 2002. Children treated at CHIRPP hospitals in areas in which checking was allowed were compared with children in areas in which checking was not allowed.

RESULTS. Of the 4736 hockey injuries, 3006 (63%) were in Ontario and 1730 (37%) were in Quebec. Most of the injuries occurred in areas in which checking was allowed (2824 [59.6%]). At ages 10 to 13, players had significantly greater odds of suffering a checking injury where checking was allowed (odds ratio [OR]: 1.86; 95% confidence interval [CI]: 1.6–2.11). Players in this age group were also more likely to suffer a concussion (OR: 1.42; 95% CI: 0.98–2.05) or fracture (OR: 1.25; 95% CI: 1.06–1.47) where checking was allowed. Among older players, when checking was allowed in both provinces, there were higher odds (OR: 1.90; 95% CI: 1.36–2.66) of receiving a checking injury in the province that had introduced checking at a younger age, suggesting that there is no protective effect from learning to check earlier.

CONCLUSIONS. Increased injuries attributable to checking were observed where checking was allowed. This study supports policies that disallow body checking to reduce ice hockey injuries in children.

www.pediatrics.org/cgi/doi/10.1542/peds.2005-1163

doi:10.1542/peds.2005-1163

Key Words

sports, hockey, body-checking rules

Abbreviations

CHIRPP—Canadian Hospitals Injury Reporting and Prevention Program
OR—odds ratio

CI—confidence interval

Accepted for publication Aug 19, 2005

Address correspondence to Alison Macpherson, PhD, School of Kinesiology and Health Sciences, 337 Bethune College, York University, 4700 Keele St, Toronto, ON, Canada M3J 1P3. E-mail: alison3@yorku.ca

PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275). Copyright © 2006 by the American Academy of Pediatrics

ICE HOCKEY IS A popular children's sport in Canada and elsewhere. In Ontario and Quebec, 2 Canadian provinces, >200 000 children are registered in organized hockey leagues. Concerns about injuries related to hockey, however, are common.¹⁻⁴ The Canadian Institute for Health Information estimates that in 2001-2002 there were >3554 visits to emergency departments in Ontario for hockey-related injuries to children between 10 and 15 years of age.⁵

Body checking is a common mechanism of youth ice hockey injuries. Hockey Canada defines body checking as "individual defensive tactic designed to legally separate the puck carrier from the puck. This tactic is the result of a defensive player applying physical extension of the body toward the puck carrier in an opposite or parallel direction."⁶ In addition, "a legal body check is one in which a player checks an opponent who is in possession of the puck, by using his hip or body from the front, diagonally from the front, or straight from the side, and does not take more than 2 fast steps in executing the check." Previous studies suggest that body checking is associated with high rates of hockey-related injuries.^{2,3} The American Academy of Pediatrics recommends limiting checking in players ≤ 15 years of age.⁷ However, since 1986, the Canadian Hockey Association has allowed body checking beginning at ages 12 to 13 (peewee level). In addition, during the 1998/1999 hockey season, the Ontario Hockey Federation began a 5-year pilot project that introduced body checking at ages 10 to 11 (atom level) in the competitive leagues (rep hockey). The evaluation of this pilot project has been controversial and resulted in media scrutiny of the results and conflicting views related to the role of body checking among young hockey players. Opponents of early checking worry about checking-related injuries in children and argue that developing strong skating, shooting, stick handling, and passing skills will produce better players and fewer injuries. However, proponents argue that children who learn to check earlier will sustain fewer injuries later on and will become better players.

In contrast, in Quebec, body checking has only been allowed at ages 14 to 15 (bantam rep level). Children <14 years old are not allowed to body check. This policy is based, at least in part, on the work of Régnier et al,⁸ who found that allowing younger children to body check resulted in more penalties and more aggressive play. The relationship between rule changes and injuries is of particular concern in hockey, because an estimated 95% of children's hockey-related injuries occur when they are playing in an organized league.⁹

The objective of this study was to compare proportions of hockey injuries associated with body checking among 10- to 13-year-olds in jurisdictions in which body checking is allowed with jurisdictions in which it is not allowed. A second, related objective was to compare proportions of concussions and fractures between juris-

dictions in all age groups. We also compared checking injuries, fractures, and concussions between Ontario and Quebec among 14- and 15-year-olds, for whom checking is allowed in both provinces.

METHODS

Data from the Canadian Hospitals Injury Reporting and Prevention Program (CHIRPP, Health Canada) were used. CHIRPP is an injury-surveillance program that collects data on circumstances and outcomes of injury at selected pediatric emergency departments (mainly large teaching hospitals). The validity of CHIRPP data has been reported previously.^{10,11} All participating hospitals in Ontario and Quebec were included except the Children's Hospital of Eastern Ontario in Ottawa because it serves children from Eastern Ontario and Western Quebec.

All boys between 10 and 15 years of age who presented to participating emergency departments with a hockey-related injury from September 1995 to the end of August 2002 were included. The patient (parents or child) is asked to complete information about the injury on the front of the CHIRPP form, including where the child was at the time of the injury, what the child was doing, and what went wrong to cause the injury. The treating physician completes clinical information on the back of the CHIRPP form.

Injuries were characterized as checking or nonchecking injuries based on the written description in the "what went wrong?" field. The methodology used was based on that developed by McFaull.¹² To be included as a checking injury, the written description had to include the words "checked," "body checked," "hit into boards," or "hit by player" or "mis en échec," "heurté," "plaqué" (the common French terms for checking). All other injuries were classified as nonchecking injuries. Concussions and fractures were defined on the basis of the coding provided by the treating physician in the emergency department.

Because guidelines associated with body checking are related to the hockey level, boys were classified on the basis of their age at the time of the injury. Although the age groupings within the Canadian Hockey Association⁶ have now changed, the reported groupings of atom (10/11 years), peewee (12/13 years), and bantam (14/15 years) remained consistent throughout our study period. In 2002/2003 there were ~89 000 boys (10-15 years) registered in hockey in Ontario (population: ~12 million) and 42 000 boys (10-15 years) registered in Quebec (population: ~7.5 million).

Checking was defined as "allowed" for (1) all 12- and 13-year-old players in Ontario (peewee level) and (2) 10- and 11-year-old players (atom level) in Ontario playing between 1998/1999 and 2001/2002 in all parts of Ontario except Kingston, which did not participate in the pilot project. Players were assumed to play hockey in

the area in which the emergency-department visit occurred.

All 14/15-year-old players (bantam level) in both provinces were allowed to check, so the number of checking injuries and concussions are compared between provinces and analyzed separately.

The primary outcome was the proportion of injuries attributable to checking. In other words, the number of nonchecking injuries that was presented to a hospital served as an indicator of exposure to hockey, because we had no information on the number of players by hospital catchment area. Previous methodologic studies of CHIRPP data suggest that using age-specific proportions of injuries rather than counts is associated with improved validity of CHIRPP data.¹³

Statistical analyses were conducted by using the SAS 8.0 system (SAS Institute, Inc, Cary, NC). The odds ratios (ORs) for sustaining checking injuries (compared with nonchecking injuries) were calculated by using Mantel-Haenszel χ^2 statistics. For players in the younger age groups, the odds of suffering a checking injury, concussion, or fracture were compared between jurisdictions in which checking was allowed to areas in which checking was not allowed. For older players (14- and 15-year-olds), the odds of sustaining a checking injury, concussion, or fracture were compared between Ontario and Quebec. Players in Ontario had between 2 and 4 years of experience with allowed checking, whereas those playing in Quebec were experiencing permitted checking for the first time.

This study was approved by the Hospital for Sick Children's Research Ethics Board in March 2003.

RESULTS

There were 4736 hockey injuries reported to CHIRPP from participating hospitals in Ontario and Quebec from 1995 to 2002. Where checking was allowed, there were 2540 injuries. Table 1 lists the number and percentage of children with checking injuries, fractures, and concussions at the younger age-group levels in areas in which checking was allowed and areas in which checking was not allowed. The proportion of injuries attributable to

checking was higher in areas in which checking was allowed. For example, for 10- and 11-year-olds, 49% of the injuries were checking-related where checking was allowed compared with 41% where checking was not allowed. The difference was more pronounced among 12- and 13-year-olds, with 48% of the injuries being checking-related where checking was allowed compared with 27% where checking was not allowed. The resulting OR for sustaining a checking injury (compared with a nonchecking injury) in areas in which checking was allowed was 1.83 (95% confidence interval [CI]: 1.58–2.11). Slightly higher proportions of concussions (OR: 1.42; 95% CI: 0.98–2.05) and significantly more fractures (OR: 1.25; 95% CI: 1.06–1.47) were also observed in jurisdictions in which checking was allowed.

Table 2 depicts the results for older (ages 14 and 15) players. At this level, checking is allowed in both provinces, so we compared the proportion of checking injuries, fractures, and concussions between Ontario and Quebec. Older players in Ontario were significantly more likely to have received a checking injury (OR: 1.90; 95% CI: 1.36–2.66). There was no significant difference in the proportion of concussions in this age group (OR: 1.6; 95% CI: 0.68–3.81) or in the proportion of fractures (OR: 0.82; 95% CI: 0.58–1.17).

DISCUSSION

Increased injuries attributable to checking were observed among younger players when checking was allowed. Injuries related to checking were more severe, with a statistically significant increase in the proportion of fractures and an increase in the proportion of concussions that approached statistical significance. Older players in Ontario, with earlier checking experience, had greater odds of sustaining checking injuries than their Quebec counterparts and slightly greater odds of receiving a concussion; therefore, it is unlikely that there was a protective effect of learning to check earlier.

The primary limitation of this study is that it is not population-based, so the calculation of rates is not possible. In addition, the participating hospitals are mostly pediatric teaching hospitals, which do not capture all

TABLE 1 Comparison of Injuries in Jurisdictions in Which Body Checking Was Allowed and Not Allowed, 1995–2002

Age Group	Type of Injury	Checking Allowed, n (%)	Checking Not Allowed, n (%)
10- and 11-y-old players (atom)	Checking-related	258 (49)	681 (41)
	Fractures	147 (29)	396 (25)
	Concussions	20 (4)	42 (3)
Total hockey injuries		526	1642
11- and 12-y-old players (pee wee)	Checking-related	574 (48)	148 (27)
	Fractures	345 (30)	135 (25)
	Concussions	40 (3)	13 (2)
Total hockey injuries		1184	554

Source: Canadian Hospitals Injury Reporting and Prevention Program.

TABLE 2 Comparison of Checking Injuries and Concussions in 14- to 15-Year-Old (Bantam) Players in Ontario (With 2 to 4 Years of Body-Checking Experience) and Quebec (Experiencing Body Checking for the First Time), 1995–2002

Type of Injury	Bantam Players in Ontario, <i>n</i> (%)	Bantam Players in Quebec, <i>n</i> (%)
Checking-related	160 (31.4)	62 (19.4)
Concussions	18 (3.6)	7 (2.2)
Fractures	93 (18.7)	68 (21.8)
Total hockey injuries	510	320

Source: Canadian Hospitals Injury Reporting and Prevention Program.

hockey injuries. The results may not be generalizable to other health care settings. However, previous studies regarding the validity of CHIRPP data suggest that using age-specific proportions of injuries generally produces valid results for comparative studies.¹³

The injury data used in this study were gathered within the context of the health care system. All of the players in our study were treated at a hospital emergency department. The advantage of CHIRPP data is that the diagnoses and injury mechanisms are recorded very reliably, and the advantage of emergency-department data is that the injuries included are of sufficient severity to be worth preventing. Furthermore, routinely collected health care data minimize the possibility for bias resulting from parents' self-report in the context of a study of hockey-related injuries. Parents knowingly participating in a study of changes to hockey rules may over- or underreport the role of body checking in their child's injury; this concern would not apply to our study. Finally, this study compares injuries between 2 provinces with similar hockey organizations, aside from differences in their body-checking rules.

Checking was defined as "allowed" among 10- and 11-year-old players in Ontario subsequent to the rule change that allowed checking at the elite (rep) level. However, within the injury data, it was not possible to distinguish between players who played at the elite level from other players. We hypothesize that the relatively small difference in checking injuries seen in the youngest age group reflects this methodologic limitation.

Checking injuries were noted in situations in which checking was not permitted. In some cases, the injury may have been a result of contact with another player that was not intended to be a check. Hockey Canada defines body contact as a "defense tactic designed to legally block or impede the progress of an offensive puck carrier.... The defensive player may not hit the offensive player in an effort to initiate contact. There must be no action where the puck carrier is pushed, hit, or shoved into the boards."⁶ Some of the injuries classified as checking injuries may have been the result of body contact rather than body checking. Some other checking injuries may have occurred in the context of informal

play in which no rules were in place. However, we believe that the difference is unlikely to vary systematically between the 2 provinces and therefore are unlikely to bias the results presented here.

Injuries were classified as checking only when checking was mentioned explicitly as the cause in the written description. This approach may underestimate the proportion of contact injuries, which have been reported to account for up to 86% of hockey injuries.² By including injuries explicitly recorded as involving checking, we feel that we minimized the possibility of misclassification bias even if we may have underestimated the total number of checking injuries.

Several studies have highlighted the need for caution when allowing young children to body check in organized hockey.^{1,8} The results of our study support their conclusions. Body checking among younger players was associated with an increased risk of injury, a risk that was not reduced among older players. Ice hockey has been associated with a high incidence of head injury.¹⁴

Current recommendations have been published by the American Academy of Pediatrics and the Canadian Academy of Sports Medicine. These recommendations are based on reviews of the literature and expert panels. The American Academy of Pediatrics guideline suggests that "[b]ody checking not be allowed in youth hockey for children 15 years old or younger."⁷ Similar recommendations from the Canadian Academy of Sports Medicine propose that "Bantam hockey (age 14–15) is a more appropriate age at which to *begin* teaching the techniques, but in a graduated fashion (i.e. hip check and blocking only, no contact near boards). Full body checking can begin at the Midget (16–17) level when less variability between player's size exists."¹⁵ Current practice in Quebec falls within these guidelines. The Canadian Hockey Association's current policy is to allow body checking at the peewee level (ages 12 and 13), and they endorsed the decision to allow body checking at the atom (ages 10 and 11) rep level in Ontario. Body checking at these levels is inconsistent with recommendations of both the American Academy of Pediatrics and the Canadian Academy of Sports Medicine. It is possible that training programs for players and coaches may mitigate the adverse effects of checking. Evaluation of such programs will continue to inform the debate about body checking.

What this study adds is evidence, from a hospital perspective, that ice hockey injuries resulting from body checking are more common when checking is permitted for younger players (ages 10–13). Severe injuries such as concussions and fractures are also more common when checking is allowed for younger players. In addition, a protective effect of learning to check earlier was not observed.

CONCLUSIONS

Policies that permit younger players to body check were accompanied by an increase in body-checking injuries, particularly fractures and a slightly increased risk of concussion. On the basis of our results, we suggest that children should play hockey only in noncontact leagues until at least the age of 14.

ACKNOWLEDGMENTS

The data in this study were provided by the Canadian Hospitals Injury Reporting and Prevention Program (CHIRPP). We also acknowledge funding from the CHIRPP at the Hospital for Sick Children. Alison Macpherson was the recipient of a postdoctoral fellowship award from the Canadian Institutes for Health Research.

We thank the CHIRPP and each of the participating sites. We also thank Dr Michael Schull for comments on a previous version of the manuscript.

REFERENCES

1. Marchie A, Cusimano MD. Bodychecking and concussions in ice hockey: should our youth pay the price? *CMAJ*. 2003;169:124–133
2. Brust JD, Leonard BJ, Pheley A, Roberts WO. Children's ice hockey injuries. *Am J Dis Child*. 1992;146:741–747
3. Reid SR, Losek JD. Factors associated with significant injuries in youth ice hockey players. *Pediatr Emerg Care*. 1999;15:310–313
4. Tator CH, Carson JD, Edmonds VE. Spinal injuries in ice hockey. *Clin Sports Med*. 1998;17:183–194
5. Canadian Institute for Health Information. News and events: hockey injuries. Available at: www.cihi.ca. Accessed December 3, 2003
6. Hockey Canada. Background on checking. Available at: www.hockeycanada.ca/e/develop/checking/index.html. Accessed November 16, 2005
7. American Academy of Pediatrics, Committee on Sports Medicine and Fitness. Safety in youth ice hockey: the effects of body checking. *Pediatrics*. 2000;105:657–658
8. Régnier G, Boileau R, Marcotte G, et al. Effects of body checking in the pee-wee (12 and 13 years old) division in the province of Quebec. In: Castaldi CR, Hoerner EF, eds. *Safety in Ice Hockey*. Philadelphia, PA: American Society for Testing and Materials 1989:84–103. ASTM STP 1050
9. Goulet C. In: Beaulne G, ed. Other sports and recreation injuries. In: *For the Safety of Canadian Children and Youth: From Injury Data to Preventive Measures*. Ottawa, Ontario, Canada: Health Canada; 1997
10. Macarthur C, Dougherty G, Pless IB. Reliability and validity of proxy respondent information about childhood injury: an assessment of a Canadian surveillance system. *Am J Epidemiol*. 1997;145:834–841
11. Pickett W, Brison RJ, Mackenzie SG, et al. Youth injury data in the Canadian Hospitals Injury Reporting and Prevention Program: do they represent the Canadian experience? *Inj Prev*. 2000;6:9–15
12. McFaul S. Contact injuries in minor hockey: a review of the CHIRPP database for the 1998/1999 hockey season. *CHIRPP News*. 2001;19:1–9. Available at: www.phac-aspc.gc.ca/publicat/chirpp-schirpt.19jan01/index.html. Accessed November 16, 2005
13. Mackenzie SG, Pless IB. CHIRPP: Canada's principal injury surveillance program. Canadian Hospitals Injury Reporting and Prevention Program. *Inj Prev*. 1999;5:208–213
14. Kelly KD, Lissel HL, Rowe BH, Vincenten JA, Voaklander DC. Sport and recreation-related head injuries treated in the emergency department. *Clin J Sport Med*. 2001;11:77–81
15. Canadian Academy of Sport Medicine. Position statement: violence and injuries in ice hockey. 1998. Available at: www.casm-acms.org/PositionStatements/HockeyViolEng.pfd. Accessed November 16, 2005

Body-Checking Rules and Childhood Injuries in Ice Hockey

Alison Macpherson, Linda Rothman and Andrew Howard

Pediatrics 2006;117:e143

DOI: 10.1542/peds.2005-1163

Updated Information & Services

including high resolution figures, can be found at:
<http://pediatrics.aappublications.org/content/117/2/e143>

References

This article cites 10 articles, 4 of which you can access for free at:
<http://pediatrics.aappublications.org/content/117/2/e143#BIBL>

Subspecialty Collections

This article, along with others on similar topics, appears in the following collection(s):
Injury, Violence & Poison Prevention
http://www.aappublications.org/cgi/collection/injury_violence_-_poison_prevention_sub
Sports Medicine/Physical Fitness
http://www.aappublications.org/cgi/collection/sports_medicine:physical_fitness_sub

Permissions & Licensing

Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at:
<http://www.aappublications.org/site/misc/Permissions.xhtml>

Reprints

Information about ordering reprints can be found online:
<http://www.aappublications.org/site/misc/reprints.xhtml>

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™



PEDIATRICS®

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

Body-Checking Rules and Childhood Injuries in Ice Hockey

Alison Macpherson, Linda Rothman and Andrew Howard

Pediatrics 2006;117:e143

DOI: 10.1542/peds.2005-1163

The online version of this article, along with updated information and services, is located on the World Wide Web at:

<http://pediatrics.aappublications.org/content/117/2/e143>

Pediatrics is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 1948. Pediatrics is owned, published, and trademarked by the American Academy of Pediatrics, 141 Northwest Point Boulevard, Elk Grove Village, Illinois, 60007. Copyright © 2006 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 1073-0397.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™

