Concussion Prevention in Youth Ice Hockey

Concussion in Sport Symposium
Sport Information Resource Centre
Paul Eliason, PhD
January 31, 2024

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Sport Injury Prevention Research Centre

Highlighting Partnerships

Sport Injury Preven/on Research Centre

Community Sport Partners

Community Clinical Partners

2004-2024

Knowledge Broker

Knowledge Broker

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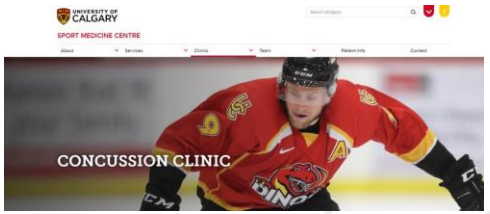

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Concussion Rates in Ice Hockey: Professional vs. Youth

National Hockey League:

1.8/1000 player hours

Benson et al (2011)

U13 Body Checking League:

1.47/1000 player hours

Emery et al (2010)

Public Health Concern!

Body Checking Policy in Under-13 (ages 11-12)

ORIGINAL CONTRIBUTION

Risk of Injury Associated With Body Checking Among Youth Ice Hockey Players

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Jian Kang, PhD
Ian Shrier, MD, PhD
Claude Goulet, PhD
Brent E. Hagel, PhD
Brian W. Benson, MD, PhD
Alberto Nettel-Aguirre, PhD
Jenelle R. McAllister, MSc
Gavin M. Hamilton, MSc
Willem H. Meeuwisse, MD, PhD

Context Ice hockey has one of the highest sport participation and injury rates in youth in Canada. Body checking is the predominant mechanism of injury in leagues in which it is permitted.

Objective To determine if risk of injury and concussion differ for Pee Wee (ages 11-12 years) ice hockey players in a league in which body checking is permitted (Alberta, Canada) vs a league in which body checking is not permitted (Quebec, Canada).

Design, Setting, and Participants Prospective cohort study conducted in Alberta and Quebec during the 2007-2008 Pee Wee ice hockey season. Participants (N=2154) were players from teams in the top 60% of divisions of play.

Main Outcome Measures Incidence rate ratios adjusted for cluster based on Poisson regression for game- and practice-related injury and concussion.

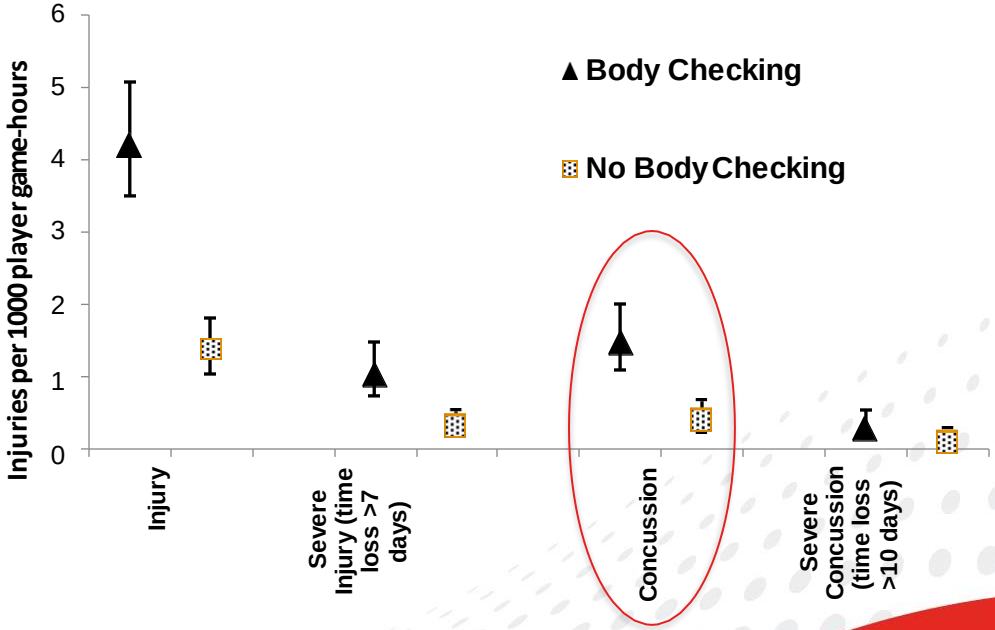
Results Seventy-four Pee Wee teams from Alberta (n=1108 players) and 76 Pee Wee teams from Quebec (n=1046 players) completed the study. In total, there were 241 injuries (78 concussions) reported in Alberta (85 077 exposure-hours) and 91 injuries (23 concussions) reported in Quebec (82 099 exposure-hours). For game-related injuries, the Alberta vs Quebec incidence rate ratio was 3.26 (95% confidence interval [CI], 2.31-4.60 [n=209 and n=70 for Alberta and Quebec, respectively]) for all injuries, 3.88 (95% CI, 1.91-7.89 [n=73 and n=20]) for concussion, 3.30 (95% CI, 1.77-6.17 [n=51 and n=16]) for severe injury (time loss, >7 days), and 3.61 (95% CI, 1.16-11.23 [n=14 and n=4]) for severe concussion (time loss, >10 days). The estimated absolute risk reduction (injuries per 1000 player-hours) that would be achieved if body checking were not permitted in Alberta was 2.84 (95% CI, 2.18-3.49) for all game-related injuries, 0.72 (95% CI, 0.40-1.04) for severe injuries, 1.08 (95% CI, 0.70-1.46) for concussion, and 0.20 (95% CI, 0.04-0.37) for severe concussion. There was no difference between provinces for practice-related injuries.

Conclusion Among 11- to 12-year-old ice hockey players, playing in a league in which body checking is permitted compared with playing in a league in which body checking is not permitted was associated with a 3-fold increased risk of all game-related injuries and the categories of concussion, severe injury, and severe concussion.

JAMA. 2010;303(22):2265-2272 www.jama.com

ICE HOCKEY IS A POPULAR NORTH American winter sport, with more than 550 000 registered youth players in Hockey Canada and more than 340 000 registered players in the USA Hockey Association in 2008-2009.[1,2] Despite the advantages of sport participation, there is increasing concern regarding the frequency of ice hockey injuries in youth. Canadian data suggest that hockey injuries account for 10% of all youth sport injuries.[3,4] Body checking has been associated with 45% to 86% of injuries among youth ice hockey players.[5-8] Recently, attention has been focused on the increased frequency of concussive head injuries in youth hockey.[9] Concussion has been

JAMA Emery et al 2010



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Research and Community Engagement

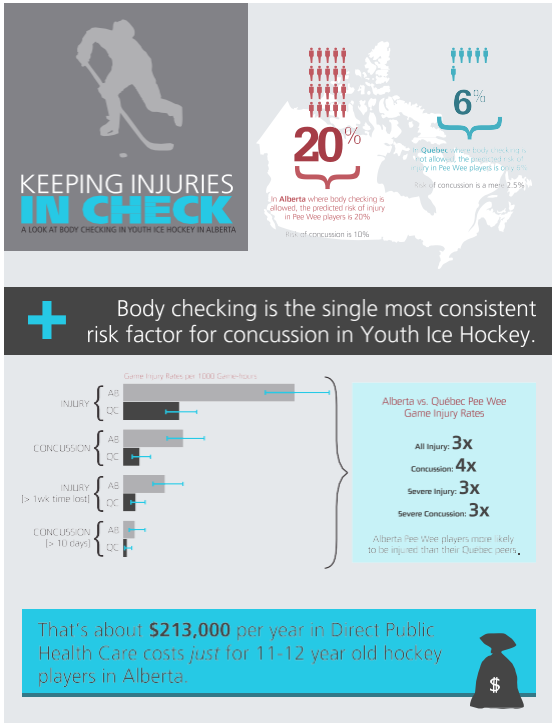
PUBLIC HEALTH INTERVENTION

Informing body checking policy in youth ice hockey in Canada: A discussion meeting with researchers and community stakeholders

Carly D. McKay, PhD,[1] Willem H. Meeuwisse, MD, PhD,[1,2] Carolyn A. Emery, PT, PhD[1-3]

Can J Public Health 2014;105(6):e445-e449.

Paul Carson - VP Hockey Development (Hockey Canada)



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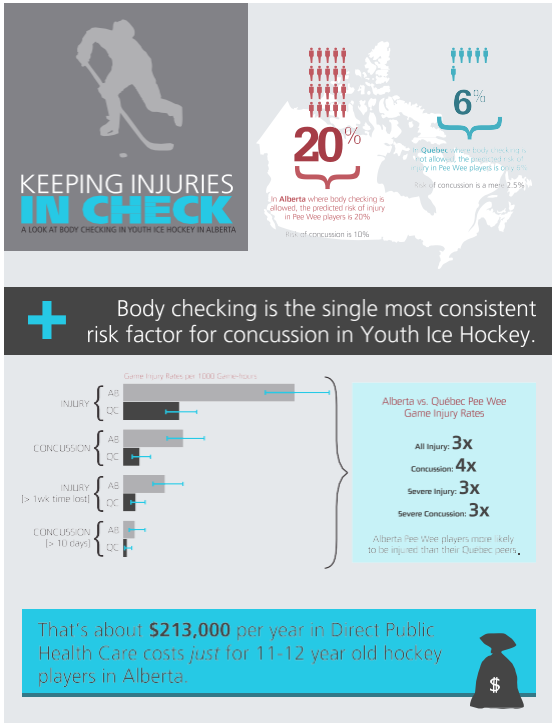
Research Informs Body Checking Policy Changes



Hockey Canada votes to ban bodychecking in peewee hockey

Hitting taken out of the game for players under 13

CBC Sports · Posted: May 25, 2013 1:01 PM ET | Last Updated: May 25, 2013

Bob Nicholson is the president and CEO of Hockey Canada, the group that voted to take bodychecking out of peewee-level hockey on Saturday. (File/Canadian Press)

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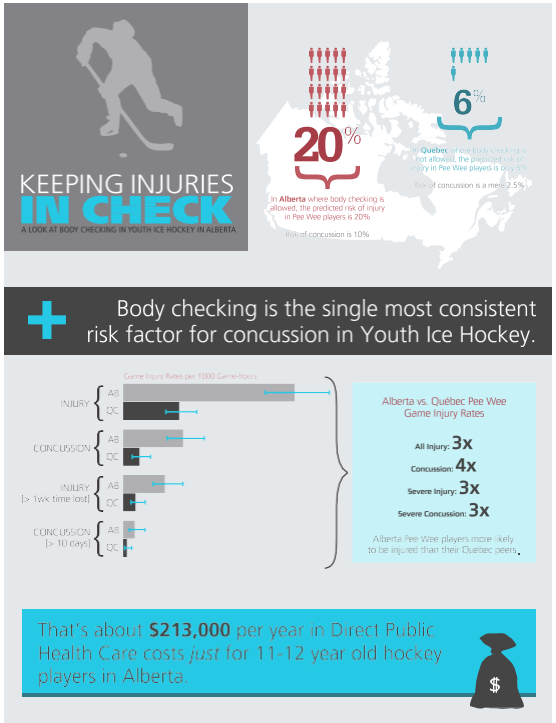

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CANADA

Hockey Edmonton bans body checking at many levels of Bantam and Midget hockey

By Emily Mertz · Global News

Posted April 20, 2016 12:29 pm · Updated April 21, 2016 12:27 am

British Columbia

Campaign to ban bodychecking in bantam hockey divides parents

Saskatoon, Regina hockey associations ban body checking in Midget, Bantam B levels

Body checking will remain in the more competitive levels of play

Cory Coleman · CBC News · Posted: May 15, 2019 9:35 AM CT | Last Updated: May 15, 2019

Evaluation of BC Policy Changes

Concussion rates decreased by:

BJSM Black et al. 2016

- Under-13 (ages 11-12) ➔ **64% reduction**
  - IRR= 0.36 (95% CI: 0.22-0.58)

BJSM Emery et al. 2019

- Under-15 (ages 13-14) ➔ **40% reduction**
  - IRR=0.60 (95% CI: 0.31-1.18)

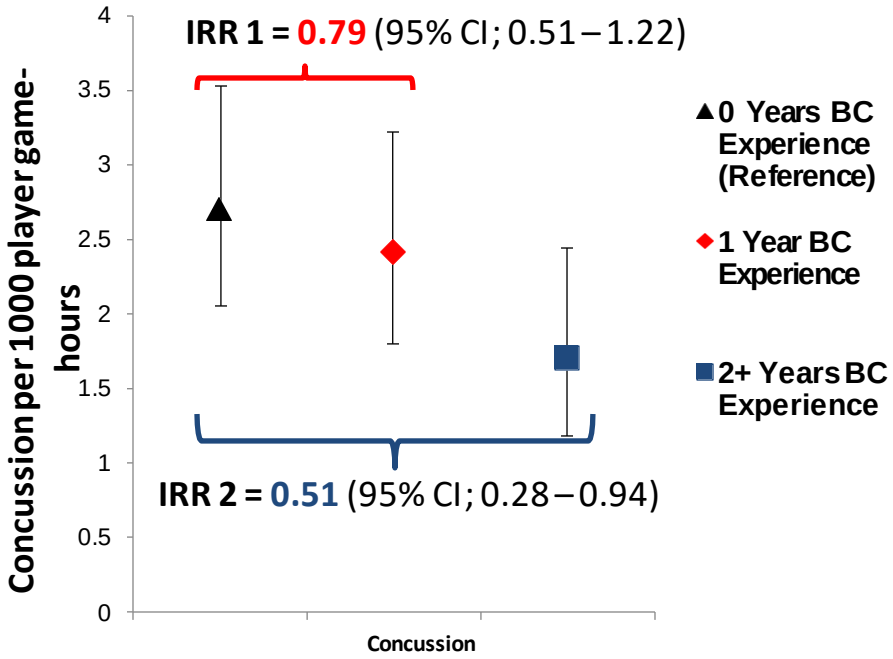
BJSM Emery et al. 2022

- Under-18 (ages 15-17) ➔ **51% reduction**
  - IRR=0.49 (95% CI: 0.26-0.89)

Unintended Consequences of BC Policy Changes

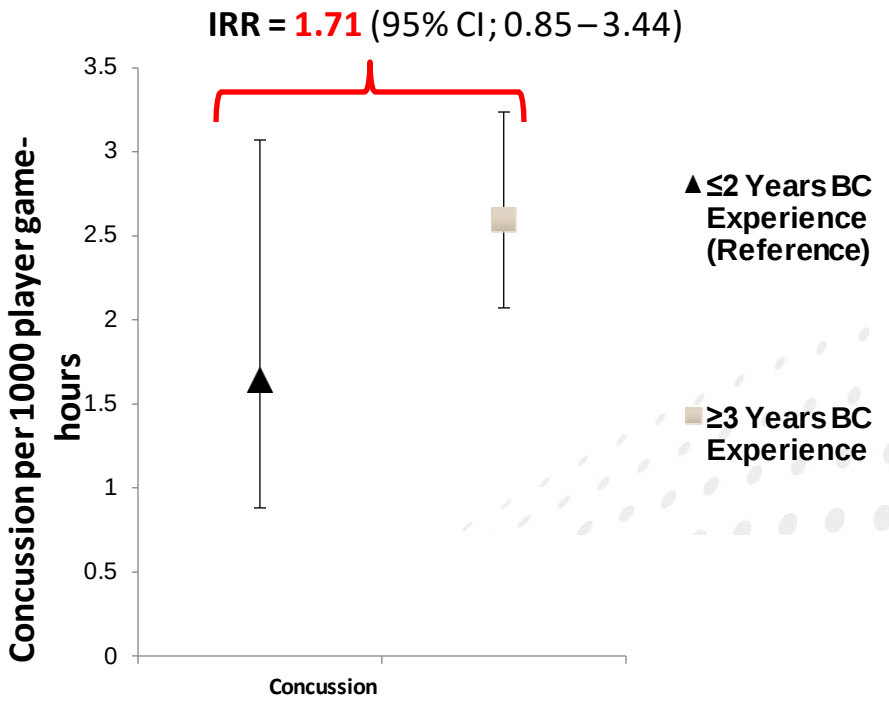
Under-15

BJSM Eliason et al. 2022



Under-18

CMAJ Eliason et al. 2022



IRRs based on mul=ple mul=level Poisson regression;
Offset for exposure hours and adjusted for covariates **(year of play, level of play, player weight, previous injury/concussion, and posi9on), and random effects at a team level.**

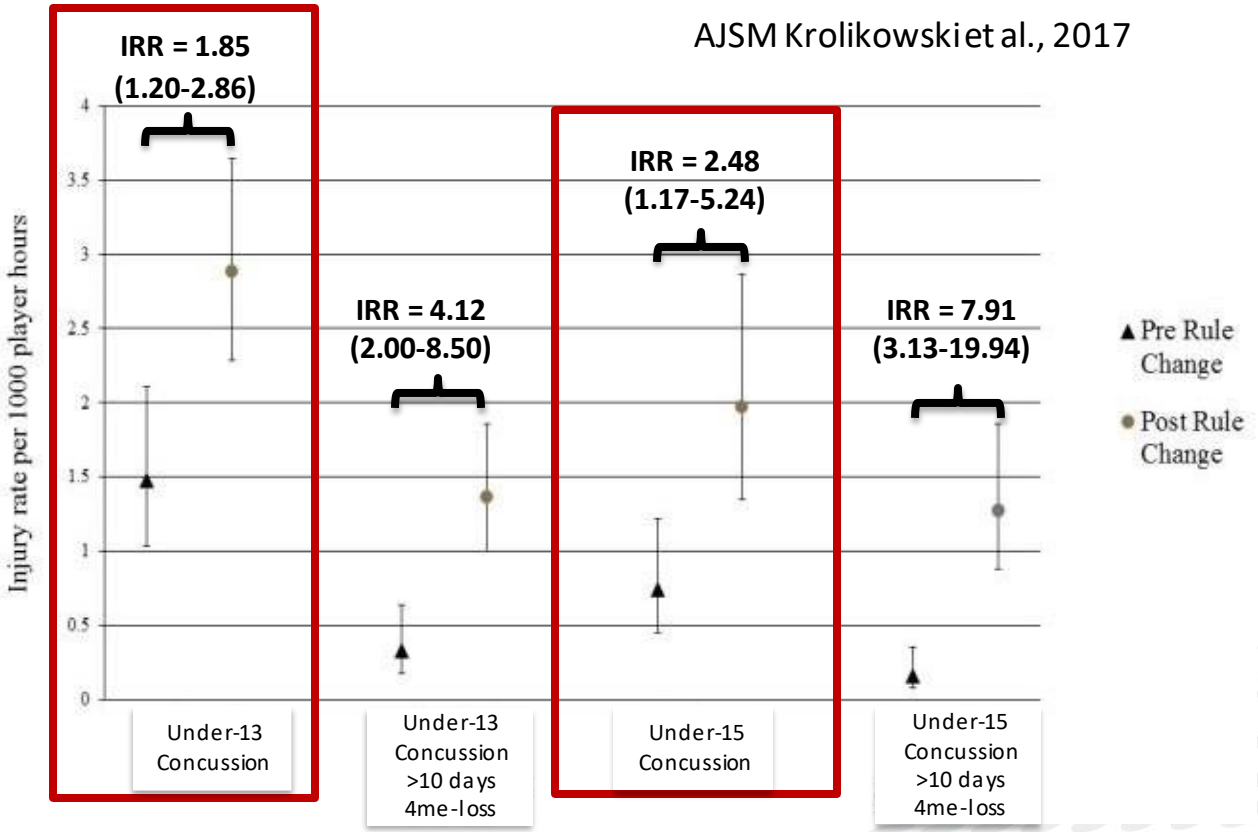
“Zero Tolerance for Head Contact”

Rule 6.5: Penalizes **any** player head contact either intentional or unintentional

Aimed to reduce the risk of concussion in Canadian youth ice hockey

“Zero Tolerance for Head Contact” Concussion Rates

AJSM Krolikowski et al., 2017



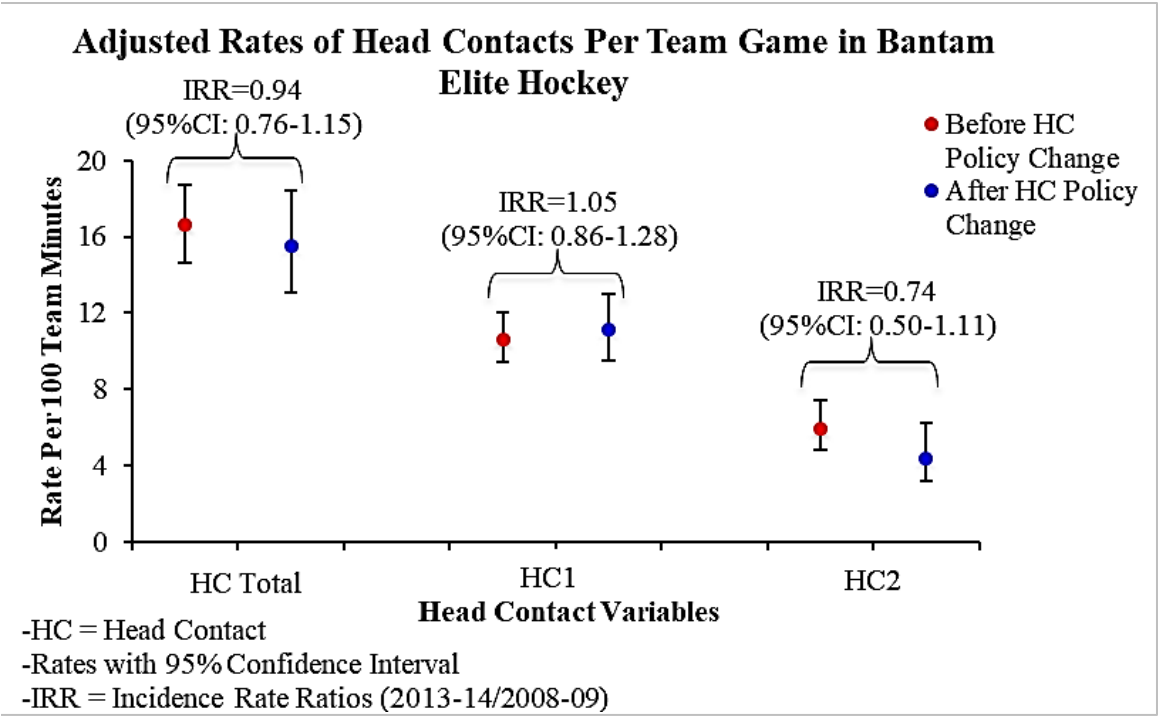
Reasons for ⬆ Rate?

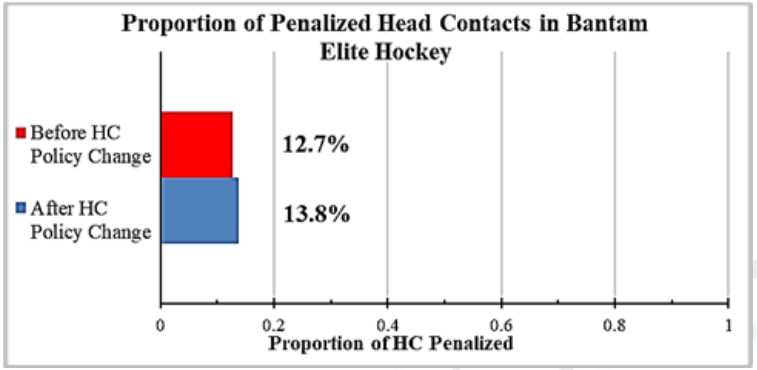
Media attention
Greater reporting
Referral bias
Not evidence-informed

"Zero Tolerance for Head Contact"

Head Contacts

AJSM Williamson et al., 2021





HC incidence and enforcement did <u>not</u> differ with policy implementa2on

Referee Assessment of HC Penalties

CJSM Williamson et al., 2023

Table 3: Concurrent Validity and Inter-Rater Reliability based on the HC videos.

Video Categories	Responses (n)	Validity	Inter-Rater Reliability	
		Median Score vs Gold Standard % (IQR)	Percent Agreement % (95%CI)	Fleiss Kappa (95%CI)
Penalty (Yes/No)				
Gold Standard	1466	85.1 (51.7-96.2)	75.8 (66.0-85.5)	0.366 (0.162-0.570)
Penalty Type				
Gold Standard	1087	81.5 (62.7-95.6)	70.3 (58.0-82.5)	0.213 (0.019-0.407)
Penalty Intensity				
Gold Standard	1087	53.7 (47.2-64.5)	52.7 (45.6-59.8)	0.170 (0.061-0.278)

Notes. Comparison including 16 videos in which the gold standard assessed a HC penalty. Median score of 100 participant referees.

In-game factors may be a primary limita2on for referee HC enforcement

Equipment: Mouth Guard Use

OR=0.36 (95% CI 0.17 - 0.73) ↓ **64% lower odds of concussion**

Off the shelf mouthguards: OR=0.31 (95% CI: 0.14 - 0.65) ↓ **69%**

DenEst Custom fit mouthguards: OR=0.51 (95% CI: 0.22 - 1.10) ↓ **49%**

BJSM Chisholm et al 2019

IRR=0.66 (95% CI 0.51-0.86) ↓ **34% lower rate of concussion**

Off the shelf mouthguards: IRR=0.61 (95% CI: 0.46-0.81) ↓ **39%**

DenEst Custom fit mouthguards: OR=0.73 (95% CI: 0.54-0.99) ↓ **27%**

BJSM Kolstad et al 2023

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Helmet Fit

12 comprehensive criteria assessing:
Helmet mobility | Helmet posiUon
Chin strap fit | Facemask fit

Declan Pa)on

Alex Gamble

PaNon D et al 2019; Gamble et al., 2020

Self-Reported Questions				
1. How does the helmet fit?	Excellent	Good	Fair	Poor
2. How comfortable is the helmet?	Excellent	Good	Fair	Poor
Assessor Observations				
3. Helmet fits snugly on all sides			Yes	No
4. Helmet covers the base of the skull			Yes	No
5. Chin strap fastened			Yes	No
6. Chin strap not loose			Yes	No
7. Crown of helmet is 1-2 fingers above eyebrows			Yes	No
8. Helmet does not impinge neck movement			Yes	No
9. Helmet does not cover eyes when pressing down			Yes	No
10. Facemask does not slip when pulled left/right			Yes	No
11. Facemask does not slip when pulled up/down			Yes	No
12. Helmet cannot be removed without undoing chin strap			Yes	No
13. All snaps and screws in place			Yes	No
14. All padding in place			Yes	No
15. Liner not cut/shaved			Yes	No
16. Liner not worn/broken/cracked			Yes	No
17. Shell appears in good condition			Yes	No
18. Standard sticker is visible*			Yes	No
19. Helmet does not have “cage hang” (loose facemask straps)			Yes	No

		Non-injured Players (n=54)		
		<2 Missing Criteria	>1 Missing Criteria	Total
Concussed Players (n=54)	<2 Missing Criteria	20	7	27
	>1 Missing Criteria	17	10	27
	Total	37	17	54

OR	95% CI	P-value
2.67	1.04-6.81	0.040

Neuromuscular Warm-up

IOC Consensus on the Developing Youth Athlete

Bergeron et al 2015, Emery et al 2015

Aerobic

-running

-bounding

-lateral shuffles

Strength

-eccentric hamstring

-quadriceps, calf

-hip and trunk

Concussion-specific

-sensory motor

-neck control and endurance

Agility/Technical/CoordinaEon

- sport-specific jump & landing

-zigzag

Partner drills

Balance

-running

-bounding

-lateral shuffles

30-70% lower injury and lower extremity injury rates with NMT warm-ups in youth sport

Neuromuscular Warm-up

IOC Consensus on the Developing Youth Athlete

Bergeron et al 2015, Emery et al 2015

Aerobic

Reducing musculoskeletal injury and concussion risk in schoolboy rugby players with a pre-activity movement control exercise programme: a cluster randomised controlled trial

Michael D Hislop,[1] Keith A Stokes,[1] Sean Williams,[1] Carly D McKay,[1] Mike E England,[2] Simon P T Kemp,[2] Grant Trewartha[1]

72% ⬇ injuries (3x per week)

59% ⬇ concussion (3x per week)

endurance

mp & landing

-zigzag

Pa

Strength

entric hamstring

uadriceps, calf

ip and trunk

alance

-running

-bounding

NMT currently being evaluated in youth ice hockey!

30-70% lower injury and lower extremity injury rates with NMT warm-ups in youth sport

Acknowledgments

The Sport Injury Preven1on Research Centre is one of the Interna1onal Olympic Commi<ee Research Centers for the Preven1on of Injury and Protec1on of Athlete Health.

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