Comparing the Severity of Head Impacts in Ice Hockey

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Background

- Ice hockey is a fast-paced contact sport, with the highest risk for concussion injuries among collegiate team sports. Checks causing direct impact to the head account for 67% of concussions among youth aged 5-19 years, and 88% of concussions in the National Hockey League. Improved understanding is required of how the mechanics of the check influence head impact severity.

Purpose

- To measure and compare peak linear acceleration and rotational velocity of the head during common scenarios involving head impact in ice hockey.

Methods (Part I)

- Participants will include 10 hockey players from the SFU men’s hockey team. The results reported here are from pilot experiments with two healthy young adults.
- Video footage of 246 head impacts in games of the SFU men’s hockey team were analyzed. The most common scenarios involved impact to the head by the glass, hand, shoulder, and elbow (Figure 1).

Methods (Part II)

- The 3D kinematics of the participant and dummy were recorded at 650 Hz with a Qualysis MIQUS motion capture system.

Sensor Results (Part I)

- The peak resultant linear acceleration measured from the Hybrid III sensors associated with contact site (p < 0.001 from repeated-measures ANOVA; Figure 3).
- Combining front and lateral impacts, peak linear accelerations averaged 21.11 g (SD=5.21) for hand hits, 16.80 g (SD=6.55) for elbow hits and 9.03 g (SD=2.55) for shoulder hits.

Sensor Results (Part II)

- Peak resultant rotational velocity measured from the Hybrid III sensors also associated with contact site (p < 0.001 from repeated-measures ANOVA; Figure 4).

Discussion

- While ongoing trials from additional participants are required to confirm these findings, our early results suggest that impact severity is different depending on the different type of hits.
- Differences in impact severity between front-facing and lateral-facing impacts may be due to differences in neck stiffness, or differences in checking kinematics.
- Differences in peak linear acceleration and angular velocity between the Hybrid III and GForceTracker sensors may be due to differences in sampling rate or sensor accuracy.

References


Acknowledgements

I would like to thank Olivia Augiar, Tim Lui, Dr. Kim van Schooten & to the players and management of the SFU men’s hockey team for their participation in this research.