

PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	The association between concussion education and concussion knowledge, beliefs, and behaviors among youth ice hockey parents and coaches: A cross-sectional study
AUTHORS	Black, Amanda; Yeates, Keith; Babul, Shelina; Nettel-Aguirre, Alberto; Emery, Carolyn

VERSION 1 – REVIEW

REVIEWER	Nicola Starkey University of Waikato, New Zealand
REVIEW RETURNED	18-Mar-2020

GENERAL COMMENTS	<p>The paper describes the findings of a large survey assessing concussion education, knowledge, beliefs and behaviours in parents and coaches of youth ice hockey players. The key points that separate this paper from other similar research are i) the large sample size and ii) the use of the Health Action Process Approach. The paper is clear and well written and the analyses seem appropriate. I just have a couple of suggestions/ comments</p> <ol style="list-style-type: none">1. In the introduction and the discussion, the description of the HAPA framework is quite abstract, and only those who are already very familiar with the area would be able to apply your recommendations. Could you include some concrete examples of how education programmes could be modified in light of your study? This would help readers apply the findings to their context (whether it is concussion or other types of parent health education).2. The parents and coaches completed the questionnaires at home – what instructions were they given about using resources (e.g. internet) to find the answers? I think the lack of control over the testing situation should be mentioned as a limitation, particularly as the knowledge scores were quite high.3. Did you consider asking the children about their knowledge of concussion? The older children (15-17 years) may influence their parents to seek (or not) medical treatment.4. Who bears the cost of emergency medical care in Canada (as treatment costs may influence help-seeking)? Albeit the sample look quite well-educated so this may not be an influencing factor.
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REVIEWER	Michelle Weber Rawlins A.T. Still University, USA
REVIEW RETURNED	01-Apr-2020

GENERAL COMMENTS	Overall, I think this study is interesting and could add to the existing literature. However, I believe some additional clarifications and restructuring would serve readers well.
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	<p>Abstract: Difficult as so many parents also had coaching experience and so few non-parent coaches.</p> <p>Page 3, Line 29: Please describe the HAPA constructs. As written I am unsure how the constructs fit in the overall purpose of the manuscript.</p> <p>Page 4, Line 10: Consider adding specific recommendations for clinicians regarding what “educational strategies grounded in behavior change theory” are.</p> <p>Page 4, line 26, second bullet: I think it is slightly misleading to the reader to highlight this as is. The sample was predominantly parents, some of which had coaching experience.</p> <p>Introduction While the information included in the introduction is important, it makes it quite long. Consider reframing.</p> <p>Page 7, Line 8: It is still unclear to me how the HAPA model fits within the overall purpose of the manuscript.</p> <p>Methods Page 9, Line 8: Readability is a metric produced in Microsoft Word. Consider removing unless measured readability using this metric, or please report readability score.</p> <p>Page 9, Line 39: Consider adding or highlighting that the measures can be found in supplemental information.</p> <p>Page 10, Line 10: What were the choices of the Likert-Scale?</p> <p>Results Page 12, Line 8: Please include percentage for those parents who had received education.</p> <p>Page 12, Sources of Concussion Education section may be moved lower as a secondary aim.</p> <p>Page 15, Line 10: What about these results for parents? Also, abstract and introduction made seem like parents had a large role in identification too, therefore consider adding these results for this group here. Especially as there is large cross-over in this population.</p> <p>Discussion Page 16, Line 10: I think the other side of this is that some of the comparisons were fairly close. For example is 85.7 vs. 78.8% that large expected difference? Or 84% vs. 72.6%? Individuals who have been educated, one would expect some of those gaps to be larger. May be worth discussing here.</p> <p>The discussion could be extended to include the entire secondary aim results. How are those findings important for individuals who may be providing concussion education or organizations?</p> <p>I also recommend discussing behavior results.</p> <p>Limitations</p>
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	<p>Page 17: Another limitation is the large percentage of coaches who were also parents, which made up the “coach” sample.</p> <p>Conclusions Page 18, Line 8: I wonder if some clarification added here would be helpful. As written currently, I cannot differentiate in results which results relate to educated vs. non-educated coaches (although may be due to sample), so these conclusions are slightly misleading in that. Therefore recommend adding for parents specifically. I would argue that that too is tricky, as few comparison statistics were performed for behavior in this group.</p> <p>Page 18, line 13: While these conclusions make sense, It wasn't necessarily found in your sample and that was concluded due to lack of HAPA constructs being addressed in education. Therefore, I would highlight that this may be useful and then examine the effectiveness surrounding behavior in follow up studies.</p>
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VERSION 1 – AUTHOR RESPONSE

Reviewer 1

Name: Nicola Starkey

Institution and Country: University of Waikato, New Zealand

Comments

Comment 1 The paper describes the findings of a large survey assessing concussion education, knowledge, beliefs and behaviors in parents and coaches of youth ice hockey players. The key points that separate this paper from other similar research are i) the large sample size and ii) the use of the Health Action Process Approach. The paper is clear and well written and the analyses seem appropriate. I just have a couple of suggestions/ comments
1. In the introduction and the discussion, the description of the HAPA framework is quite abstract, and only those who are already very familiar with the area would be able to apply your recommendations. Could you include some concrete examples of how education programmes could be modified in light of your study? This would help readers apply the findings to their context (whether it is concussion or other types of parent health education).

Answer Thank you for your kind comments. We have added more details regarding HAPA in both the Introduction and Discussion.

Revised **Pg. 6 Introduction**
The Health Action Process Approach (HAPA) is a theoretical framework to understand the processes involved in health behavior change [20]. HAPA has been used to inform how interventions can affect multiple health behaviors (e.g. neuromuscular training programs, physical exercise, seat belt use and dietary behaviors).[21] HAPA proposes that changing health behavior consists of two phases: forming an intention to do the behavior (motivational phase), followed by a volitional stage of self-efficacy and planning to do the behavior. In the motivational phase, risk perception, positive and negative outcome expectancies, and action self-efficacy influence an individual's motivation or intention to do a behavior. [21] The volitional phase involves post-intentional factors including planning and self-efficacy. Importantly, this phase addresses a key limitation of previous social cognitive models that are characterized by a gap between intention and behavior [22]. Educational resources can target constructs for individuals in either phase. Using a theory that examines post-intentional factors is important given that parents and coaches may be subjected to environmental

and situational factors that influence a parent's intention to take their child to a physician for assessment and clearance (e.g., scheduling conflicts, resistance from the child, playoff season) or a coach's intention to remove a player from play (e.g., playoff season, parent expectations, player's insistence on playing).

Pg. 17 Discussion

The finding that exposure to concussion education was not associated with differences in the HAPA constructs is expected given the majority of concussion education programs do not target these constructs. Notably, the HAPA construct related to planning had the lowest median scores for parents (median: 5.5-6.0) and coaches (median: 4.0) irrespective of whether they were provided concussion education or not. According to HAPA, action planning is a post-intentional factor that helps bridge the intention-to-behavior gap. Concussion education that includes a specific concussion protocol provided to the coaches, parents and athletes (e.g. at a team meeting) could be developed to improve parents' and coaches' action and coping planning. When the protocol is presented to parents, the importance of seeing a physician for assessment and clearance could be discussed. Resources could include information for nearby clinics and physicians trained in concussion management where parents could take their children if they suspected a concussion. Practice scenarios involving difficult removal from play decisions for coaches, and testimonials of successful concussion management experiences, could increase both action self-efficacy and outcome expectancies.

Comment 2	The parents and coaches completed the questionnaires at home – what instructions were they given about using resources (e.g. internet) to find the answers? I think the lack of control over the testing situation should be mentioned as a limitation, particularly as the knowledge scores were quite high.
Answer	We have added a sentence in the discussion that mentions this.
Revised	Pg. 17. Discussion Given that answers to this question in this study were not found to be different between those with and without education, the increased awareness of emotional symptoms being associated with concussion may be the result of stories in the media highlighting the association between concussions and depression [33]. Parents and coaches primarily completed the questionnaire at home. We had no control on whether parents may or may not have sought outside resources to complete the questionnaire, thus potentially increasing knowledge scores in both groups; however, they were instructed to use their own knowledge. Regardless, there are still gaps in parent and coach knowledge that can be better addressed with improved concussion education programs.
Comment 3	3. Did you consider asking the children about their knowledge of concussion? The older children (15-17 years) may influence their parents to seek (or not) medical treatment.
Answer	We did ask players about their knowledge, beliefs and behaviors. But this was reported in another paper.
Comment 4	4. Who bears the cost of emergency medical care in Canada (as treatment costs may influence help-seeking)? Albeit the sample look quite well-educated so this may not be an influencing factor
Answer	In Canada, the government covers many of the costs of healthcare, including emergency medical care. When we did the interviews that informed this questionnaire, financial costs did not emerge as a barrier to concussion assessment.

Reviewer 2	
Reviewer Name: Michelle Weber Rawlins	
Institution and Country: A.T. Still University, USA	
Comments	
Comment 1	Overall, I think this study is interesting and could add to the existing literature. However, I believe some additional clarifications and restructuring would serve readers well.
Answer	Thank you, we would be happy to address your comments.
Comment 2 Abstract	Difficult as so many parents also had coaching experience and so few non-parent coaches.
Answer	It is common for the coaches of youth hockey teams in Canada to be parents. This is especially the case with non-elite teams and is why we presented the cohort together.
Comment 3 Abstract	Page 3, Line 29: Please describe the HAPA constructs. As written I am unsure how the constructs fit in the overall purpose of the manuscript.
Answer Revised	We have now included the HAPA constructs in the abstract. See response to editor comment 1.
Comment 4 Abstract	Page 4, Line 10: Consider adding specific recommendations for clinicians regarding what “educational strategies grounded in behavior change theory” are.
Answer	While this would be a great addition, we do not have enough space in the abstract to provide specific recommendation. We have expanded on this in the paper. See response to reviewer 1, comment 1.
Comment 5 Abstract	Page 4, line 26, second bullet: I think it is slightly misleading to the reader to highlight this as is. The sample was predominantly parents, some of which had coaching experience.
Answer Revised	We have modified this bullet. See response to editor comment 2.
Comment 6 Introduction	While the information included in the introduction is important, it makes it quite long. Consider reframing.
Answer	Thank you for your comment. We have made some revisions to the Introduction, which is now only 3 pages long.
Comment 7 Introduction	Page 7, Line 8: It is still unclear to me how the HAPA model fits within the overall purpose of the manuscript.
Answer	The HAPA model helps inform key constructs that are important to consider if we want to change behavior. We have added more details to demonstrate how this information can be used in response to reviewer 1 comment 1.
Comment 8 Methods	Page 9, Line 8: Readability is a metric produced in Microsoft Word. Consider removing unless measured readability using this metric, or please report readability score.
Answer	We can appreciate the confusion with terms here. We have replaced readability with the word clarity to avoid confusion.
Revised	Pg. 9 Methods A panel of experts, consisting of certified athletic therapists, physicians, physiotherapists, and concussion researchers, reviewed the questionnaires for face validity and clarity . The questionnaires were pilot tested with a group of parents and coaches in Vancouver and Calgary for clarity and option response verification
Comment 9 Methods	Page 9, Line 39: Consider adding or highlighting that the measures can be found in supplemental information.
Answer	This has been added.

	<p>Pg. 10 Methods Concussion knowledge was assessed using 32 multiple-choice items assessing knowledge of the concussion definition (1 item), awareness of risks (3 items), misconceptions (2 items), recognition (3 items), signs and symptoms (8 real symptoms, 8 distractor symptoms), management response to concussion (3 times), and recovery/return to play (4 items) (See online supplement).</p>
Comment 10 Methods	Page 10, Line 10: What were the choices of the Likert-Scale?
Answer	We have added this in.
Revised	<p>Pg. 10 Methods Specific HAPA constructs (e.g., risk perception, outcome expectancies, action self-efficacy, intention, action planning, maintenance self-efficacy, recovery self-efficacy) were calculated using 2 to 8 items, all measured on a seven-point Likert Scale (i.e. 1-Strongly Disagree – 7-Strongly Agree, 1-Not at all Likely – 7-Extremely Likely, or 1-Not at all Bad – 7-Extremely Bad).</p>
Comment 11 Results	Page 12, Line 8: Please include percentage for those parents who had received education.
Answer	We have added this.
Revised	<p>Pg.12 Results In total, 649 participants [421/536 (78.5%) non-coach parents] had received concussion education; of those, 195 (30.1%) participants obtained the education during the current season.</p>
Comment 12 Results	Page 12, Sources of Concussion Education section may be moved lower as a secondary aim.
Answer	We feel sources of concussion education may help to contextualize the difference in concussion knowledge between the groups. This is why we present those findings before presenting the knowledge scores.
Comment 13 Results	Page 15, Line 10: What about these results for parents? Also, abstract and introduction made seem like parents had a large role in identification too, therefore consider adding these results for this group here. Especially as there is large cross-over in this population.
Answer	Parents can play a role in identification but if they are not on the hockey bench (coach or safety person), their role is less likely to be related to immediate removal from play (the behavior examined by this paper); instead, parents might be involved in identifying the delayed onset of symptoms after the game. The coach or safety designate typically makes the decision to remove from play. Therefore, the behavior question related to not removing the athlete when a concussion was suspected was only asked if participants reported coaching experience. All results have been presented.
Comment 14 Discussion	Page 16, Line 10: I think the other side of this is that some of the comparisons were fairly close. For example is 85.7 vs. 78.8% that large expected difference? Or 84% vs. 72.6%? Individuals who have been educated, one would expect some of those gaps to be larger. May be worth discussing here.
Answer	Due to the word limitations, we are unable to discuss every item in the knowledge questionnaire. We have selected a 5% difference in point estimate proportion as potentially relevant in the study and bolded it in our results to help navigate the reader.
Comment 15 Discussion	The discussion could be extended to include the entire secondary aim results. How are those findings important for individuals who may be providing concussion education or organizations?

Answer	We have provided some more recommendations in our response to reviewer 1 comment 1.
Comment 16 Discussion	I also recommend discussing behavior results.
Answer Revised	<p>We have added a paragraph discussing behaviors.</p> <p>Pg. 18 Discussion:</p> <p>In this study, approximately 15-20% of parents did not consult a physician for assessment and clearance to return to play following all of their child's suspected concussions and 17.6% of coaches reported at least one player continuing to play with a suspected concussion before removal. The percentage of coaches is similar to the findings by Bramley et al. 2012[34] who reported that when provided with scenarios describing concussions, 80% of coaches or more would never allow a player back into a game. They found that the severity of the concussion described in the scenario affected the percentage of coaches that would never allow a player to return.[34] Due to the low number of participants who suspected a concussion in either their child or their players in the last year, we could not examine how concussion education affected behaviors directly.</p>
Comment 17 Limitations	Page 17: Another limitation is the large percentage of coaches who were also parents, which made up the "coach" sample.
Answer	We appreciate this comment, however, we believe this makes the study more generalizable to the target population we are trying to study- youth hockey coaches.
Comment 18 Conclusions	Page 18, Line 8: I wonder if some clarification added here would be helpful. As written currently, I cannot differentiate in results which results relate to educated vs. non-educated coaches (although may be due to sample), so these conclusions are slightly misleading in that. Therefore recommend adding for parents specifically. I would argue that that too is tricky, as few comparison statistics were performed for behavior in this group.
Answer	Due to the low number of coaches without education, statistical comparison between educated and non-educated coach behavior was difficult. Only 6 of the 71 participants who managed a concussion in the last season were not exposed to concussion education. All participants who reported not removing a suspected concussion from play were also exposed to concussion education. We noted the small number of coaches without concussion experience as a limitation in the manuscript. We have added these details in the result section. We have also clarified and softened some of the language in the conclusions to reflect that this limitation also could affect the HAPA constructs.
Revised	<p>Pg. 15 Results</p> <p>Of the 132 coaches who completed the section on coach behavior, 71 (53.8%) reported having suspected a concussion in the last season (65/71 also reported being exposed to concussion education). Only 6/70 (8.6%, 1 missing response) coaches reported not removing an athlete when a concussion was suspected and all reported receiving concussion education. However, 12/68 (17.6%) coaches reported that at least one player continued to play for a short time following a potential concussion mechanism (e.g., being struck in the head) before being removed (11/12 reported being exposed to concussion education).</p> <p>Pg. 19 Conclusions</p> <p>However, this research suggests that the education currently being provided may not influence constructs that are related to concussion management behaviors including immediate removal from play (coaches) or physician assessment and clearance (parents).</p>

Comment 19 Conclusions	Page 18, line 13: While these conclusions make sense, It wasn't necessarily found in your sample and that was concluded due to lack of HAPA constructs being addressed in education. Therefore, I would highlight that this may be useful and then examine the effectiveness surrounding behavior in follow up studies.
Answer Revised	We have made this modification. Pg. 20 Conclusions Consideration of behavior change techniques when providing concussion education, rather than focusing on knowledge alone warrants further consideration in follow-up studies.

VERSION 2 – REVIEW

REVIEWER	Nicola Starkey University of Waikato
REVIEW RETURNED	09-Jun-2020
GENERAL COMMENTS	Thank you for addressing my comments. I have no further comments
REVIEWER	Michelle Weber Rawlins A.T. Still University, USA
REVIEW RETURNED	10-Jun-2020
GENERAL COMMENTS	Thank you for your edits and responses. I understand many comments were limited due to space restrictions, and I believe edits will serve the reader well.