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Canadian High School Coaches' Experiences, Insights, and Perceived Roles With Sport-Related Concussions

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There is a need to improve concussion education and prevention efforts for youth athletes and those responsible for their care. The purpose of this study was to understand Canadian high school coaches' insights and perceptions of concussions. Using a case study design, eight high school coaches were interviewed and the data were analysed using a hierarchical content analysis. Findings indicated that participants primarily acquired information about concussions through their own experiences as athletes and parents, and from reports in the sports media. The coaches' felt their role with concussions was to teach athletes safety techniques during practices and competitions and to encourage them to accurately report their concussion symptoms. In addition, participants forwarded a number of recommendations to improve the dissemination of information to coaches. Results from this study will add to a limited body of concussion research with youth sport coaches. Participants' insights provide researchers and clinicians with information about coaches' perceived role with sport-related concussions.

Keywords: coaching science; brain concussion; qualitative research; concussion education; concussion-reporting

Concussions have been termed the silent epidemic because of the injury's prominence in North America and around the world (Carroll & Rosner, 2012). Specific to sport, youth athletes often experience more severe concussion symptoms and take longer to recover than adults (Davis & Purcell, 2014), facts that are concerning given the injury's high incidence rates in youth sports (Lincoln et al., 2011; Marar, McIlvain, Fields, & Comstock, 2012). Among youth sport participants, high school football, ice hockey, soccer, and basketball athletes have reported a high incidence of concussions (Lincoln et al., 2011; Marar et al., 2012). Evidence also suggests that athletes underreport concussions (Delaney, Lamfookon, Bloom, Al-Kashmiri, & Correa, 2015; Kroshus, Baugh, Daneshvar,

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& Viswanath, 2014; Torres et al., 2013), which is dangerous because of the negative health implications associated with repeated concussions such as second impact syndrome (Dessy, Rasouli, & Choudri, 2014), protracted symptoms (e.g., Caron, Bloom, Johnston, & Sabiston, 2013), and potential link to Chronic Traumatic Encephalopathy (Galgano, Cantu, & Chin, 2014). Due to the high rates of concussions among youth athletes, the propensity to underreport the injury, and the potential for adverse long-term sequelae, researchers and stakeholders in sport must continue to explore ways to improve athletes' safety. One such method is assessing the concussion knowledge of coaches and the strategies they implement to create a safer sporting environment for their athletes.

Despite being a prominent injury in sport, research suggests that the general knowledge surrounding concussions is "substantially inaccurate" (McKinlay, Bishop, & McLellan, 2011, p. 761). A concussion is a brain injury that results from forces acting on the brain caused by a direct or indirect blow to the head, neck, or body (McCrory et al., 2013). Concussions have been called invisible injuries (Bloom, Horton, Johnston, & McCrory, 2004) because signs of trauma, such as loss of transient consciousness, are rarely apparent following an acute concussive injury. Evidence of injury is often manifested in a series of symptoms ranging from headaches and dizziness to irritability and depression. Approximately 80% of concussed individuals recover within a two-week period, however a smaller percentage of athletes suffer from protracted symptoms, which is exacerbated by a number of factors such as age and history of the injury (McCrory et al., 2013). Youth and high school athletes are particularly susceptible to suffering protracted symptoms because their bodies are still maturing and undergoing normal physical and physiological development (Davis & Purcell, 2014). As a result, concussion experts have favoured strategies aimed at making youth sport safer, such as implementing rule changes that eliminate or minimize contact and collisions (e.g., Caron & Bloom, 2015). Another important factor is ensuring that coaches are knowledgeable about concussions and that they are taking appropriate steps to manage the safety of the sporting environment.

Coaches are community leaders and role models who are responsible for athletes' health, well-being, and personal development (Bloom, Falcão, & Caron, 2014). Research has shown that effective coaches promote athletes' growth outside of sport to develop positive citizenship (Côté & Gilbert, 2009; Falcão, Bloom, & Gilbert, 2012). On the other hand, negative coaching behaviours have been associated with adverse athlete outcomes such as low self-esteem and increased anxiety (e.g., Gearity & Murray, 2011; Smith, Smoll, & Barnett, 1995). Scholars have argued that effective coaches should use sport as a tool to develop the *whole* person, because positive behaviours learned in the sport environment can be transferred to other facets of life (Bennie, 2011; Côté & Gilbert, 2009; Falcão et al., 2012). For example, sport participation enables athletes to cultivate teamwork, commitment, discipline, and time management skills. Social and critical thinking skills can also be developed through sport participation, which contributes to the development of positive self-concepts (Bennie, 2011; White & Bennie, 2015). Part of a coach's role may also include providing athletes with health-related information on issues such as concussions. Although coaches are not expected to have the same training as health professionals, coaches could help to protect athletes' health and well-being by promoting a safe sporting environment, reinforcing concussion safety and the importance of reporting possible head injuries. To date, research has yet to examine coaches' perceived roles with concussed athletes.

National coach certification agencies across the world have made an effort to provide coaches with information regarding injury prevention and management. For example, the Coaching Association of Canada (CAC) offers a coach certification program that strives to develop competent and ethical coaches who promote a safe and positive sporting environment. Despite their mandate, the extent to which they have prioritised concussion education is unclear. For example, the CAC developed a series of online modules aimed at educating coaches about concussions (Coaching Association of Canada, n.d.), however coaches are not required to complete the modules to gain CAC accreditation. Moreover, researchers have yet to determine if coaches are using online concussion information and how this information is improving athletes' safety during practices and competitions.

To date, websites and other passive dissemination strategies such as pamphlets and fact sheets have been the most common methods to educate coaches about concussions (McCrory et al., 2013). For example, the US Centers for Disease Control and Prevention's "HEADS UP to concussions" campaign is one of the largest education initiatives worldwide (Sarmiento, Hoffman, Dmitrovski, & Lee, 2014). Over the past decade, the CDC has created more than 50 educational products such as pamphlets and fact sheets as well as websites to provide coaches with information about concussions (HEADS UP to Youth Sport Coaches, 2015; National Council for Youth Sports, 2015). However, some have questioned whether these types of passive educational materials are effective when used as a standalone strategy (Caron, Bloom, Falcão, & Sweet, 2015; Provvidenza & Johnston, 2009; Straus, Tetroe, & Graham, 2013). As a result, it is not surprising that a body of research found that many coaches are still lacking knowledge on aspects of concussions (Bramley, Kroft, Polk, Newberry, & Silvis, 2012; Valovich McLeod, Schwartz, & Bay, 2007; White et al., 2014). This is unfortunate when considering the high incidence of concussions among adolescents in high school (Lincoln et al., 2011; Marar et al., 2012) coupled with the prominence of a coach in an athlete's life (Bloom et al., 2014), including the recovery from injury (Podlog, Heil, & Schulte, 2014). Therefore, the purpose of the current study was to understand Canadian high school coaches' insights and perceptions of concussions. The research questions guiding this work were:

- How do high school coaches create a safe sporting environment for their athletes?
- How have concussions impacted their coaching practice?
- What is a high school coach's role when an athlete suffers a concussion?
- How do high school coaches acquire information about concussions?

Method

Design

An instrumental case study design was selected to frame high school coaches' insights on concussions (Stake, 2005). Case study is a type of methodology used in qualitative research to provide an in-depth understanding about a phenomenon, bound within a time and/or setting (Creswell, 2013; Stake, 2005). Stake noted that instrumental case studies are primarily interested in the *phenomenon* and information about the *case* is secondary. Following Stake's recommendations, information about the high school setting (i.e., the case) will be detailed first, to contextualize the coaches' insights and perceptions of concussions (i.e., the phenomenon).

All eight participants coached at the same private (i.e., fee-paying) Canadian high school. This high school has resources, facilities, and a student body whose socioeconomic statuses are higher than the majority in Canada. The high school employs a full-time athletic director (AD) who is responsible for coordinating all athletic activities. The AD was knowledgeable about concussions, and had taken a number of steps to create a safe sporting environment for student-athletes at the high school, including attending concussion seminars nationally and internationally. Furthermore, the AD hired full-time athletic therapists (ATs) who attend all practices and games and who have knowledge about the concussion return to play protocol (cf. McCrory et al., 2013). ATs are specialists in the human musculoskeletal system and have expertise in emergency care, injury assessment, and rehabilitation. Taken together, contextual information about the high school (i.e., the case) was provided to generate a deeper understanding of coaches' setting as well as factors that influenced their perceptions of concussions (i.e., the phenomenon).

Participants

Six male and two female coaches participated in this study. The participants were the head coach of the male or female basketball, football, ice hockey, or soccer teams, and their athletes ranged in age from 15 to 18 years. Coaches ranged in age from 30 to 58 years old (M = 42.38) and they had been coaching at the high school level between 5 and 33 years (M = 12.88). Table 1 provides more information about the coaches' characteristics.

Procedure

Upon obtaining approval from the lead investigator's university research ethics council, the coaches were contacted via e-mail and invited to participate in this study. Those who expressed interest identified a time and location for an individual, face-to-face interview with the lead investigator. All eight coaches provided verbal and written informed consent before participating in this study. Each interview took place in a quiet area at the school such as the coach's office, classroom, or other meeting room. Interviews lasted between 40 and 90 minutes and all interviews were conducted in English in May 2014.

Interview Guide

All three members of the research team have experience conducting interviews in the areas of coaching and concussions. Based on our knowledge and experiences, an interview guide (see Appendix) was created to gather coaches' insights on concussions. The interview guide was divided into three parts: opening, key, and concluding

Table 1 Participants' Characteristics

Pseudonym	Age Range	Gender	Current Team	Years Coaching at the High School Level	Highest Level of Athletic Competition
Thomas	30–34	M	Girls Flag Football	5	University Football
Victoria	30–34	F	Girls Basketball	9	University Track and Field
Mark	35–39	M	Boys Basketball	10	High School Basketball/ Ice Hockey
Kevin	40–44	M	Boys Hockey	11	Professional Ice Hockey
Martin	40–44	M	Boys Football	13	University Football
Charles	45–49	M	Girls Hockey	6	Recreational Ice Hockey/Baseball
Jessica	45–49	F	Girls Soccer	16	Professional Soccer
Richard	50+	M	Boys Soccer	33	University Soccer

questions. Opening questions gathered information about participants' athletic careers and coaching evolution (e.g., "Briefly describe your athletic career" and "Briefly describe your coaching evolution"). Key questions were more specific to the purpose and research questions identified for this study (e.g., "In what ways have concussions impacted the way you coach?" and "How has the media's portrayal of concussions influenced your perceptions of the injury?"). Concluding questions afforded each participant the opportunity to provide additional comments or pose questions to the lead investigator (e.g., "Would you like to add anything else to our interview?" and "Do you have any other questions or comments?").

Data Analysis

Interviews were audio recorded, transcribed verbatim, and stored using the NVivo 10 software package (QSR International, 2014). The 92 single-spaced pages of transcription were analysed using a hierarchical content analysis, a commonly used strategy for analysing qualitative data (Sparkes & Smith, 2014). Sparkes and Smith noted that hierarchical content analyses are a method of identifying patterns in a data set and determining how patterns interact. One of its strengths is that data are presented in a logical manner, which makes it "amenable for peer dissemination" (Sparkes & Smith, 2014, p. 117). We followed Côté, Salmela, Baria, and Russell's (1993) guidelines for conducting a hierarchical content analysis, a strategy that has previously been used to analyse qualitative data in coaching science (e.g., Greenwood, Davids, & Renshaw, 2014).

Each transcript was read several times to gain familiarity with the data. The first stage of analysis involved breaking up each transcript into *meaning units* (Côté et al., 1993). Each meaning unit represents one coherent idea or piece of information (Côté et al., 1993). This process yielded 370 meaning units across the eight transcripts. Once the first stage of analysis was complete, the second stage involved assigning *tags* to each meaning unit. A tag is a name or label that represents a meaning unit. The lead investigator selected a representative transcript, which was both descriptive and consistent with the majority of coaches' perspectives, to generate the first set of tags. Each meaning unit was assigned a tag. Similar meaning units were assigned the same tag. Tags generated from the transcripts were mapped onto a master list. This process was repeated with the other seven transcripts. Assigning tags to meaning units was viewed as an iterative process and the master list was modified when new ideas or concepts arose upon analysing subsequent transcripts. A total of 32 tags were generated from this stage. The third stage of the hierarchical analysis involved grouping tags into *properties* (Côté et al., 1993). Tags that featured similar characteristics were grouped into the same property. The analysis yielded a total of six properties and they were labelled based on commonalities amongst the tags. The fourth stage of analysis involved grouping the six properties into *categories*, which represents the highest level of analysis (Côté et al., 1993). Three categories emerged from this stage.

Trustworthiness. Researchers are encouraged to outline the measures taken to ensure the trustworthiness of qualitative studies so readers can judge the quality of the findings (Sparkes & Smith, 2014). Indeed, several steps were taken to enhance the trustworthiness of this study, which included dependability, confirmability, and credibility (Lincoln & Guba, 1985; Sparkes & Smith, 2014). An audit trail was used to ensure the *dependability* of this study, whereby the research process was detailed so readers could inspect and assess the merit of the findings as well as the researchers' interpretations (Lincoln & Guba, 1985). The current study was transparent in outlining the research process, which included specific information about the high school setting, participant recruitment, data collection, as well as specific examples of the interview guide (see Appendix) and the hierarchical content analysis (see Table 2). *Confirmability* was established by using a "critical friend" (Sparkes & Smith, 2014, p. 182), whose role was to offer alternative interpretations of findings and to ensure researcher reflexivity during the analysis. The critical friend was a colleague at the lead investigator's institution who was not otherwise involved in the project. Meetings with the critical friend occurred at each stage of the analysis to ensure findings best represented coaches' perceptions of concussions. Lincoln and Guba noted that *credibility* was another way to establish trustworthiness in a qualitative study. The current study used researcher triangulation to demonstrate credible findings by matching the participant's reality to the researcher's representation of that reality (Sparkes & Smith, 2014). The authors met regularly through all aspects of the research process, which helped to ensure we cocreated the most realistic representation of high school coaches' perceptions of concussions.

Results

Results from the inductive, hierarchical content analysis revealed three categories, which were labelled *Coach Concussion Knowledge and Training, Coaches' Roles with Concussed Athletes,* and *Recommendations for Concussion Education* (see Table 2). These three categories will be discussed using quotes from the eight participants. Pseudonyms were assigned to each participant (see Table 1) to credit their comments and to protect their identities.

Coach Concussion Knowledge and Training

In this category, coaches described how they acquired concussion knowledge, the types of concussion training they received, and the practices they implemented to maximize their athletes' health and safety.

The coaches all felt that their direct (i.e., as athletes) and indirect (i.e., as parents) experiences with concussions were a primary method of acquiring knowledge

Table 2 Overview of Results

Categories	1. Coach Concussion Knowledge and Training	2. Coaches' Roles with Concussed Athletes	3. Recommendations for Concussion Education
Properties	- Coach Concussion Knowledge	- Athlete Interaction	- Concussion Prevention
	- Coaching High School Sports	- High School Concussion Procedures	
	- Personal Injuries and Concussions		
Tags	- Awareness (9)	- Athlete concussion deception (15)	- Coach concussion education (27)
	- Coaching evolution (11)	- Athlete concussion education (4)	- Equipment (7)
	- Coaching credentials (8)	- Athlete injury deception (3)	- Media (10)
	- Coaching style (16)	- Athlete interactions—concussions (13)	- Teaching prevention strategies (12)
	- Concussions—coaching style (15)	- Athletic Director (7)	
	- Knowledge (18)	- Athletic Therapists—general (20)	
	- Knowledge through experience (19)	- Athletic Therapists—treatment (9)	
	- Higher education experiences (2)	- Concussions—school protocol (30)	
	- Parents—general (6)	- Injuries—school protocol (13)	
	- Parents—concussions (19)	- Knowing your athletes (5)	
	- Personal athletic experiences (12)		
	- Personal injury experiences (4)		
	- Personal concussion experiences (13)		
	- Personal concussion rehabilitation (7)		
	- Physical signs (5)		
	- Prevalence (6)		
	- Sports in general (4)		
	- Sports injuries—general (21)		

Note. Numbers in parentheses represent the frequency of each tag

about concussions. Some of the participants had concussions as athletes and felt it helped them understand and empathize with their athletes who suffered a concussion:

> I feel like I know what it really feels like to have a concussion. I know that there are so many different depths of concussion but I feel that I know that it's not just a headache. I will never forget being concussed. Especially those first few days after it happened. I was really sick (Victoria).

In addition to experiences as athletes, some of the participants were parents and said they learned about concussions by observing their children experience this injury. Their experiences can be summarized by a quote from Charles:

> I mean… you observe concussions from the outside, but unless you have ever had one it is hard to understand what they are going through. In this case, it was my own son who just came off the ice because he got hit in the head. That really brought it to life for me. The difficulties that he went through for a good two-week period… I could see that within the first week the panic in his voice and through the discussions we had. There was definitely a sense of, 'Am I going to be like this forever? I am having trouble understanding things people are saying to me. I am forgetting things two minutes after hearing them.' My son's concussion experience really made it much more real for me. It was real before but now it was profound.

The participants also discussed how media reports helped them become more aware of concussions and acquire additional knowledge and information about the injury:

> I think media reports have changed the way I think about concussions. I take them more seriously. How many times did we get our bell rung and get back into a game? When you hear about the retired football,

> hockey, and rugby players who are describing what they are going through… I'm sure that current players would not want to experience that in their retirement (Mark).

The coaches described some recent events in North American professional sports that shaped their perceptions of concussions:

> Some of the reports in sports media have definitely opened my eyes to concussions. If we talk about some of the former National Football League players… Those guys are screwed up! Their brains are fried. I mean… look at what's happening to some of those guys. We didn't really look into concussions back then and now they are paying a price (Thomas).

Some of the coaches alluded to specific professional athletes and their concussion issues. Given the popularity of ice hockey in Canada, it was not surprising that a number of coaches discussed professional hockey players whose concussion issues were well documented in sports media:

> Sidney Crosby's concussion was a high profile case that caused people, who wouldn't call themselves hockey fans to realize, 'Oh wow! He was out for a long time. He didn't miss two-weeks or a month… we're talking five or six months.' The Crosby concussion created a lot of awareness (Kevin).

In addition to informal methods of learning about concussions, such as personal experiences and media reports, the coaches discussed their lack of exposure to formal concussion education. Of the eight coaches, Charles was the only one who reported that he participated in a formal concussion-training course, "Hockey Canada has training on concussions designed for coaches." The other seven coaches reported no exposure to formal concussion education training.

The coaches described how the growing awareness of concussions has impacted their coaching style. For example, Jessica noted: "This is high school soccer. This is not professional or World Cup. I don't care what level it is. It's just not worth risking their health." Additionally, Thomas said:

> At the end of the day, the athlete's health comes first. Their health comes first before me saying, 'I want to win the championship.' My job isn't on the line if I don't win. But it's on the line if someone has a concussion and I screw up by putting him or her back in. We play it safe and that's fine. At the end of the day, their health is most important.

The coaches also described some of the strategies they taught their athletes to help prevent concussions:

> Body checking is not allowed in girl's hockey so I'm not training them how to hit. But I have always trained them to keep their heads up. We definitely practice skating with their heads up so they can see where they are going, the play developing, their options, and who they can pass to. But, at the same time, it teaches them to avoid running into other people (Charles).

At the senior high school level (i.e., ages 15–18) in Canada, full contact/collision is permitted in boys' hockey and football. As a result, the coaches of these teams felt it was important to teach their athletes proper technique for body checking in hockey and tackling in football. They felt that incorporating hitting and tackling drills in practices helped improve their athletes' awareness during competitions:

> I focus on teaching kids how to body check properly. When I'm explaining what I want, I'm very clear with guys. So when I say, 'Run the guy, lay the body, or be hard in front of the net', I try to do a better job of delineating for guys what is okay and what isn't. By doing that, you're educating players that you're not supposed to strike people in the head (Kevin).

> My quarterbacks hit because I can't have a quarterback who goes four weeks without contact. When he throws an interception, he becomes a tackler. Quarterbacks have to hit and tackle sometimes. I cross my fingers because I don't want a quarterback to get injured tackling during practice. But I'd rather have a kid get nicked up during practice and miss a game rather than going to a game unprepared and making a live tackle in an open field and have something terrible happen (Martin).

Coaches' Roles With Concussed Athletes

In this category, coaches detailed the series of events that unfolded when one of their athletes (potentially) suffered a concussion, which included their interactions with ATs, parents, and athletes.

The school's strict protocol for dealing with athletes with a concussion was discussed by all coaches, whose comments can be summarized by Richard:

> We have developed a concussion protocol at the school in the last four or five years. Concussions are totally out of my hands. I'm not involved with it [diagnosis, management] at all, except to ask when they've completed their return to play. I don't have a say in it.

The coaches said they were thankful their school had a concussion protocol in place because it took all concussion-related decisions "out of their hands".

The concussion protocol was created and monitored by the AD and the full-time ATs. The coaches noted that the majority of high schools in their region did not have the resources to employ ATs for their teams. As a result, they described feeling fortunate they worked in a setting where support was provided for them:

> For the past six or seven years, I've been in the enviable position of having an AT with my team all the time. When a kid gets hurt on the ice, I have someone who can evaluate them immediately and take care of them so I can concentrate on coaching. The AT then tells me 'Yes, he's fine' or 'Just to be cautious, let's keep him out for the rest of the game' (Kevin).

In addition, all eight coaches described interactions they had with ATs when one of their athletes suffered a possible concussion during a practice or game:

> After evaluating the injury, the AT will come speak to me. If she says to me that a player can't play again, I say, 'No problem'. To me, the game isn't big enough. I let her do what she needs to do. Then I go out and talk to my player. 'You're not going to play again today and this is why…' There is no discussion until after the game or the next day (Jessica).

> Ultimately if [name of AT] says, 'This kid can't go' – he can't go. She has the training. I don't have the same type of training. I have some basic foundations but she is the expert. I'd rather her tell me, 'He physically can't…' – good. Decision made. Go sit down (Mark).

Once the decision to remove an athlete from play was made, coaches said they communicated frequently with the AT during the recovery process to learn about their athlete's progress. Martin noted: "I communicate with the AT everyday when one of my players is injured. I can text with the AT during the day." Additionally, Charles said:

> There is always communication with the AT via email when one of my athletes is out with a concussion. Once the player has been assessed, we will get an email from the therapist telling us that one of our players has suffered a concussion and that he/she will be working with them over the next few days. They give us progress reports.

Coaches also discussed communicating with parents after an athlete was diagnosed with a concussion:

> I think it helps that I call the parents when one of my athletes gets a concussion. Not from a credibility standpoint but so they know I am supporting the ATs decision. I think it's important the parents recognize that the coach is on board with the AT (Kevin).

> I don't think it's part of the concussion protocol but I will call home that evening to check on the injury and how they're feeling. The athlete will come and see me next time they're at school. If they're feeling okay, they will come in the next day and tell me what's up and that they're going to a therapy appointment after school with the AT (Victoria).

Coaches said the majority of parents were supportive and appreciative when coaches updated them on their child's concussion. However, the coaches also detailed some negative interactions with parents, such as when parents wanted their child to continue playing, despite potentially having a concussion:

> Parents come from another generation. I know some fathers who are former football players. They played community football or whatever. There is a bit of machismo – you know, 'Back in my day, we had concussions and we didn't even know it was a concussion. We were a little dizzy and then 10 minutes later they put us back in the game and we played through it. Oh, these kids today…' That's the type of thing you hear. There is still a certain amount of disbelief about concussions (Charles).

> You have some dads who think that their kid was never hurt and think they should toughen them up. You need to say to them, 'No. The AT needs to sign off on these five steps… it's going to go slow. Your son can return when they are symptom free' (Mark).

> In one particular case, my player got hit in the head and her dad was watching the game. I told her dad, 'I'm not going to play your daughter in the final.' He goes, 'Don't be f****** ridiculous! She can play. She gets sick all the time. Don't worry about it – she's fine.' I said, 'No, I'm not going to play her. If anything happened to her I would never be able to live with it.' No matter what the dad said, he wasn't going to win that battle with me (Jessica).

Although the majority of coaches reported positive interactions with parents, participants noted that some parents would occasionally try to pressure coaches into returning their child to play, despite having concussion symptoms.

In addition to communicating with the AD, ATs, and parents, the coaches also spoke with their athletes who suffered a concussion. Participants felt it was important to ensure their athletes were not hiding concussion symptoms. Coaches noted they spoke with their athletes and emphasized the importance of being honest about their symptoms:

> One of the big things for athletes is to make sure they don't hide stuff. You don't want a kid to tell you they're okay when they're not. I'm very clear with my guys. I tell them, 'It's very simple – tell the truth. If you got hit, whether I saw it or not, and now your head hurts, there's no interpretation involved – it's just honesty. It's the easiest policy' (Kevin).

Nonetheless, some participants felt that athletes were occasionally disingenuous and would report concussion symptoms, despite being asymptomatic, to avoid participating in academic or athletic endeavours. That is, athletes would "play up" or inflate their concussion symptoms. For example, Richard said that one of his colleagues discussed athletes reporting a higher number of concussions around examination periods:

> Somebody I know who coaches at another school said there was an inordinate amount of concussions one week before exams. It was ridiculous… like 18 or some silly number. Students were coming in with notes for concussions. Stuff like, 'I fell in the bathtub'… It's a really tough thing for educators and doctors to assess. It's a tricky area to tell a kid, 'You don't have a concussion.'

As a result, some coaches expressed feelings of frustration when dealing with concussions and can be summarized by Kevin's comments:

> I had two kids that were held out this year who ended up not having concussions. Just to be *incredibly* cautious we didn't let them play even though we knew they didn't have a concussion. Trust me, I was frustrated.

Furthermore, the coaches discussed the challenges of interacting with athletes whom they felt were "faking" concussions. Thomas said, "The more you know your players, I think you can tell if they are faking a concussion or not. And I know it's delicate because you don't want to accuse them of something that they are not doing." Additionally, two other coaches described interacting with athletes who were potentially "faking" concussions:

> It's getting to the point now that the kids at our school know what to say to have a concussion without having it, you know? They know the terms and what they have to say to make it seem like they have a concussion even though they do not. But you have to go with what they say (Victoria).

> We knew about kids faking concussions. But this year was the first time I've ever heard someone say, 'You're not concussed' to a player. The AT came to me and said, 'He's not concussed. I don't know if he's going to get back in the game but he's okay.' The boy came back to school three days later and participated in a charity running event. He ran…. I don't know how many laps on the field. He ran hard the whole time. He never played football again. I think he just decided that he was done with football. No one ever spoke to him about not having a concussion. We just left it (Martin).

The coaches all noted they had directly dealt with or indirectly learned about instances when athletes were disingenuous by either playing up or by downplaying their concussion symptoms. Although the coaches expressed feelings of frustration related to dealing with concussions, they noted it was not their job to question the validity of an injury. All athletes who reported concussion symptoms were removed from play and were assessed by the AT.

In sum, coaches said that part of their role involves interacting with school personnel such as the AD and ATs. Based on their personal experiences, including interactions with parents and athletes, the participants recommended a number ways to improve concussion education initiatives.

Recommendations for Concussion Education

Participants offered a number of insights to help guide future concussion efforts with athletes, parents, and coaches. Jessica and Victoria discussed ways to educate athletes about concussions:

> I think athletes could be exposed to concussion information in the pre-season or at the beginning of the season. I think injuries can be addressed at that time. They should know where to go if they have an injury as well as the protocol at the school. I think that knowledge is important. Student-athletes should be aware with our concussion protocol and our return to play protocol (Jessica).

> I think concussion information has to be given at an assembly or something. It has to be given to the masses. It's not something that should be for just this team or that team. It's a protocol for the whole school. We're concerned about every student regardless of whether they play on the senior girls basketball team (Victoria).

Coaches also felt that parents needed to receive more education about concussions. Despite reporting some negative interactions with parents, overall coaches felt that most parents were aware of the dangers of concussions:

> Concussions are certainly on parents' radar now. Our rugby turn out this year was very low. We have barely enough for a 7s rugby team. Why? Is it concern about concussions or is it just a lack of interest in rugby? I'm guessing parents are more and more concerned about athletes being involved in sports because of concussions (Richard).

> Are parents pulling their kids out of football or not allowing their kids to play football because of concussions? I think that many high school and prep school football coaches in Canada and the United States are experiencing – not all, but many – fewer kids in training camp every year (Martin).

Somewhat paradoxically, although coaches felt that parents were aware of concussions, they did not feel as though parents were necessarily knowledgeable about the injury:

> Awareness doesn't translate to knowledge. Parents need to be educated about the injury. I think that we've done a pretty good job at this school, but we can probably do better. Maybe we could have an information evening for parents to come in and learn about our concussion protocol (Kevin).

The eight participants also discussed the importance for coaches to be educated about concussions:

> I think all coaches should receive training about concussions in addition to First Aid training. I think coaches should be able to recognize – not so much the post-concussion symptoms that happen three hours after the concussion – but watching the play on the field and the infractions or the collisions of the injuries that have occurred and having the knowledge to say, 'I should probably grab [name of AT] to talk to that player at half time' (Jessica).

In addition, they discussed some ways to improve their own knowledge of concussions through formal concussion training. In particular, they recommended that online dissemination strategies might be particularly useful:

> I think that coaches should have some type of concussion training. Coaches should be able to know the general symptoms at least. And they should know the return to play protocol. How hard could a concussion test be? You can do an online course on your own time. It doesn't take more than 45 minutes or an hour. It's a piece of literature and you answer the questions (Mark).

> I think it would be really useful if coaches had concussion training available online. Online stuff is very good because you can go to it when you want on your own time and look at the videos. It would be really cool to have that kind of training (Charles).

Finally, the participants were unclear about their role in educating athletes about concussions:

> Do coaches need to provide concussion information to their athletes? That's a good question. Do I need to meet with my senior players before the year starts? Do we need to hold a clinic with all our senior athletes and talk about the symptoms of a concussion? I don't have these answers (Richard).

Discussion

Using a case study approach, the purpose of the current study was to understand Canadian high school coaches' insights and perceptions about concussions. Despite the school's progressive policies and procedures regarding concussions, which included hiring full-time health professionals to monitor their sports teams, seven of the eight coaches primarily acquired their knowledge *informally* through their experiences as athletes, coaches, and parents, as well as from reports in the media. In addition, none of the participants used or were aware of the free online materials offered by the CAC (Coaching Association of Canada, n.d.). Research has shown that coaches who had not been exposed to *formal* concussion education were lacking knowledge on the injury and were less likely to recognize concussion symptoms in their athletes (Bramley et al., 2012; Valovich McLeod et al., 2007; White et al., 2014). Furthermore, evidence suggests that coaches who completed online concussion training improved their knowledge and perceptions of the injury (Glang, Koester, Beaver, Clay, & McLaughlin, 2010). Results from the current study underscore the importance for coach certification agencies such as the CAC to consider prioritizing formal concussion education efforts for coaches.

Knowledge translation (KT) is the field of study concerned with bridging the gap between the scientific community and knowledge users by determining the most effective methods, tools, and strategies for disseminating knowledge to a population (Straus et al., 2013). As a result, principles from KT could be helpful to guide future concussion education efforts for coaches (Caron et al., 2015; Provvidenza & Johnston, 2009; Straus et al., 2013). In fact, concussion researchers Provvidenza and Johnston postulated that KT strategies could be the "missing link" (p. 69) to improving formal concussion education initiatives. Given the present sample of coaches did not appear to learn about concussions through materials supplied by coach certification agencies, researchers, clinicians, and coach certification agencies are encouraged to work collaboratively to ensure that concussion materials are developed and disseminated using principles from KT. Thus, implementing principles from KT would help to ensure coaches are receiving concussion information that is tailored to meet their needs.

All coaches in the current study felt their role with concussions involved promoting a safe sporting environment for their athletes by teaching preventative measures such as safe body checking or tackling techniques. In addition, participants stressed the importance of adhering to the ATs suggestions and prioritising athletes' health and well-being over winning in competitions, which is congruent with an athlete-centred coaching style (Cassidy, 2013; International Sport Coaching Framework, 2013). Athlete-centred coaching ideals recognize coaches' influence beyond improving athletes' performance during competitions. Results from the current study suggest that participants were focused on the growth of the whole person (Bennie, 2011; Falcão et al., 2012), which is more likely to increase athletes' enjoyment and help them to develop psychosocial skills that promote their long-term interest in sport participation (Bennie, 2011). Our results suggest that coach certification agencies should continue to develop and train coaches who put athletes' health, safety, and well-being at the forefront of their coaching practices. In addition, coaches should be equipped with the ability to teach athletes concussion safety and prevention skills during practices and competitions.

The coaches felt another part of their role with concussions was centred on communication, particularly because their athletes were occasionally disingenuous about their concussion symptoms. Previous empirical

results have found that athletes have hidden concussion symptoms to continue playing (Caron et al., 2013; Delaney et al., 2015; Kroshus et al., 2014; Torres et al., 2013). Nearly 20% of athletes surveyed in Delaney and colleagues' study said they did not report concussion symptoms within the previous 12 months, and the most common reason was feeling their concussion was not serious/severe and there was little danger involved in continuing to play. Torres et al. found that 43% of the athletes in their sample hid concussion symptoms to continue playing, and that 22% were "unlikely or very unlikely" (p. 283) to report concussion symptoms in the future. Results from the current study contribute to this growing body of literature on athletes underreporting concussion symptoms by adding insights and perceptions from a sample of high school coaches. The current findings suggest that coaches should communicate with athletes and stress the importance of accurately reporting concussion symptoms, an approach that would also help them foster a safe and supportive sporting environment (Cassidy, 2013; International Sport Coaching Framework, 2013). These results also suggest that part of a coach's role involves interacting with health professionals who are on-site during practices and games to help them identify athletes who might be suffering from a concussion.

Unique from previous empirical accounts (e.g., Delaney et al., 2015; Kroshus et al., 2014; Torres et al., 2013), the coaches in the current study felt that some of their athletes occasionally "played up" the severity of concussion symptoms to avoid sports or academic requirements, or perhaps because they wanted to discontinue playing sports but did not know how to communicate these intentions to coaches. Participants expressed feelings of frustration in relation to athletes being deceptive with concussions, however the origins of their frustrations were not clearly articulated. Given that participants' coaching practices appeared to be in line with athlete-centred coaching ideals (Bennie, 2011; Cassidy, 2013; Falcão et al., 2012), it is unlikely they were frustrated with their athletes being withheld from practices and/or competitions due to the school's strict concussion protocol. A more likely interpretation was that coaches were frustrated with the uncertainty of concussions, and particularly because they could not easily tell (a) if athletes were concussed, (b) if they were concussed and trying to downplay their symptoms, or (c) if they were not concussed but were trying to play up symptoms commonly associated with concussions. This finding further highlights the need to improve concussion education for coaches, which should include information that athletes may try to be deceptive with concussions by either playing up or downplaying their symptoms. In addition, athlete-centred coaches should consider why athletes are being deceptive about concussions and discuss their motives for not accurately reporting symptoms of the injury.

Conclusion

The current findings offer insights on coaches' perceived knowledge of and roles with concussions. These results highlight the need to improve formal concussion education efforts for coaches, and suggest that coaches need to be aware that some athletes may attempt to hide or exaggerate their concussion symptoms. Future investigations should explore this topic from the athlete's perspective, using either individual or focus group interviews that would allow them to provide in-depth descriptions and insights using their own words. In addition, the eight participants in the current study coached at a privileged high school with superior resources, such as access to full-time ATs, compared with most North American high schools. It would be interesting for future research to investigate coaches that work in different socioeconomic contexts and who do not have access to similar resources. In sum, we believe findings from the current study are valuable for the development of curriculum and educational interventions designed to improve the quality and safety of the youth sport environment.

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Appendix—Interview Guide

Opening Questions:

1. Briefly describe your athletic career.

   Sport(s) you competed in

   Highest level of competition

   Detail all head injuries experienced as an athlete

2. Briefly describe your coaching evolution.

3. Describe the most often-occurring injuries in the sport you coach.

Most serious ones

Key Questions:

4. Describe the policies, procedures, and protocols that your school has in place for dealing with serious sports injuries.

5. In what ways do your school's injury protocols, procedures, and policies differ when an athlete suffers a head injury such as a concussion?

   Coach's role/involvement throughout athlete recovery (i.e., physically and psychologically)

   Communication with athletic therapist, athletic director, parents, principal/headmaster, physician

   Most serious cases

6. How has the media's portrayal of concussions influenced your perceptions of the injury?

   Outline some of the most surprising things you have learned

   Athlete and parental awareness

7. In what ways have concussions impacted the way you coach?

   Importance of providing information to athletes about concussions

   Unsettling aspects about concussions for young athletes

   Assistant coaches

8. How important is it for coaches to be exposed to information on head injuries and concussions?

   Formal education and training

   Mandatory or not? If yes, what and where?

   Informal education

   Most helpful resources

   Challenges/barriers to accessing information/resources

Concluding Questions

9. Would you like to add anything else to our interview?

10. Do you have any other comments or questions?