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Barriers and Opportunities for Concussion Communication and Management in Youth Sports: A qualitative study

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Abstract

To identify opportunities to improve coach-athlete communication, this study examined young athletes' perceptions and concerns about concussion, as well as their information needs. A qualitative data collection approach, based on the grounded theory methodology, was utilized. Six virtual focus groups were conducted with 17 male and female athletes ages 12 to 18 years. Results indicated athletes were concerned about potential long-term effects of a concussion. Athletes described multiple barriers that interfere with concussion reporting, including: being unfamiliar with concussion signs and symptoms, perceived pressure from teammates, concerns of interference that concussion reporting can have on gameplay, and a lack of focus on concussion during play. To help address these, participants expressed an interest in hearing frequently and directly, such as during a pre-game or practice huddle, from coaches about concussion and how to prevent this injury. The results demonstrate that concussion education programs can consider promoting messages for coaches to deliver to athletes about concussion prevention strategies and the benefits of concussion reporting on an athlete's long-term health.

Keywords: *Athlete, Coach, Communication, Concussion, Sport*

A concussion is a type of traumatic brain injury (TBI) caused by a bump, blow, or jolt to the head, or a hit to the body, resulting in the head and brain moving rapidly back and forth (Centers for Disease Control and Prevention, 2017b). Concussion signs and symptoms generally are categorized as: somatic (e.g., headache, nausea), behavioral and emotional (e.g., irritability, sadness), cognitive (e.g., complaints of difficulty concentrating or slowed reaction time), or sleep-related (e.g., sleeping more than usual, trouble falling asleep) (Centers for Disease Control and Prevention, 2017a). The majority of children with a concussion are asymptomatic within a couple of weeks (7 to 14 days) (Barlow, Crawford, Stevenson, Sandhu, Belanger, & Dewey, 2010; McCrory, Meeuwisse, Dvorak, Aubry, Bailes, Broglio, . . . Vos, 2017).

The latest estimates from the Centers for Disease Control and Prevention (CDC) show there were

812,000 TBI-related emergency department visits among children age 17 and under in 2014 (Peterson, Xu, Daugherty, & Breiding, 2019). However, current national-level surveillance systems for concussion and other TBIs are unable to capture children seen in primary care offices, specialty clinics, and/or those who do not seek medical care (Arbogast, Curry, Pfeiffer, Zonfrillo, Haarbauer-Krupa, Breiding, . . . Master, 2016; Setnik & Bazarian, 2007). It is possible that this results in a significant under-counting of this injury (Arbogast et al., 2016; Bell, Breiding, & DePadilla, 2017; Setnik & Bazarian, 2007).

To reduce the risk for concussion and the potential sequelae that may result from this injury, there are several concussion education programs available in the U.S. (Graham, Rivara, Ford, & Spicer, 2014; Sarmiento, Donnell, & Hoffman, 2017). Many of these programs are directed at coaches and address concussion identification, response, and management

and seek to improve concussion reporting by athletes (Sarmento et al., 2017). Concussion reporting by athletes is critical to ensure that coaches can initiate proper protocols (such as removal from play and to ensure medical assessment). However, despite widespread concussion education efforts, athletes still may be hesitant to report concussion symptoms (Rivara, Schiff, Chrisman, Chung, Ellenbogen, & Herring, 2014). Previously identified reasons athletes may not report concussion symptoms include: not thinking a concussion is serious, fear of losing their position on the team or losing playing time during a game, concern about putting their future sports career at risk, looking weak, and letting down their teammates or the team (Chrisman, Quitiquit, & Rivara, 2013; Kerr, Register-Mihalik, Marshall, Evenson, Mihalik, & Guskiewicz, 2014; Register-Mihalik, Guskiewicz, McLeod, Linnan, Mueller, & Marshall, 2013). One study found that nearly 70% of athletes reported playing with concussion symptoms, and among this group 40% said their coaches were unaware of their possible concussion (Rivara et al., 2014). A different survey of high school football players found that only half (54%) would report concussion symptoms to a coach (Anderson, Gittelman, Mann, Cyriac, & Pomerantz, 2016). These studies demonstrate a disconnect that exists between athletes and coaches when it comes to concussion reporting and points to a need to further investigate ways to improve coach-athlete communication (Anderson et al., 2016; Rivara et al., 2014).

Thus, this paper explores young athletes' perceptions and concerns about concussion to identify potential opportunities to improve concussion reporting and coach-athlete communication. There were three research questions that guided this study: 1) What are athletes' views on concussion reporting?; 2) Are athletes comfortable talking with their coach about concussion?; and 3) What would make concussion reporting easier for athletes? Findings from this study will inform CDC's ongoing efforts to support concussion education among athletes.

Review of Literature

Along with awareness among the public, research on the potential long-term effects of concussion has expanded over the last two decades (Dyck & Talty, 2016). In particular, there is significant attention on concussion risk and long-term outcomes among athletes who play sports in which player-to-player contact is common (such as football, soccer, and ice hockey) (Dyck & Talty, 2016). Still, there is no definitive evidence on the long-term effects of contact sports on a child's developing brain (McCrory et al., 2017). One study found that prolonged exposure to repetitive head impacts, even in the absence of a diagnosed concussion, among football players increased their risk for developing cognitive, neuropsychiatric, and neurologic problems as adults (Alosco, Kasimis, Stamm, Chua, Baugh, Daneshvar, . . . Stern, 2017). Other studies suggest no short-term association with playing contact sports and adverse clinical outcomes from concussion and head impact exposure (Brett, Kuhn, Yengo-Kahn, Jeckell, Solomon, & Zuckerman, 2018; Miller, Adamson, Pink, & Sweet, 2007; Munce, Dorman, Thompson, Valentine, & Bergeron, 2015). In studies by Brett et al (2018) and Miller et al (2015), the authors used tests to assess balance, oculomotor performance, reaction time, and self-reported concussion symptoms to evaluate for changes in performance immediately after the football season. Based on their analysis, it was determined that the athletes did not demonstrate changes from baseline measures (Miller et al.; Munce et al.). While research is ongoing, the latest version of the Consensus Statement on Concussion in Sport (2017) recommends that healthcare providers "be mindful of the potential for long-term problems such as cognitive impairment, depression, etc. in the management of all athletes" (McCrory et al., 2017).

Method

This study employed a qualitative data collection approach based on the grounded theory methodology (Draper, 2004; Glaser, 1967). Grounded theory

includes the use of a set of procedures to identify themes or categories that arise directly from the data collected. These themes or categories are designed to capture the main concerns and feedback provided by study participants for the topic of interest and are not based on a preconceived hypothesis or framework (Draper, 2004; Glaser, 1967). This study is part of a larger mixed-methods research project that sought to identify opportunities to support, educate, and protect athletes from concussion. The findings reported in this study are of participants' perceptions, information needs, and preferred communication channels and messages about concussion safety. The larger research study also included parallel focus groups with parents, coaches, and school professionals and explored similar factors.

For this study, our research design included six virtual focus groups. Research staff started to reach saturation (e.g., recurring themes) after four groups, but proceeded to schedule and conduct the remaining two groups in case the participants in the remaining groups might introduce a new idea or perspective that would offer key insights that informed understanding of the issue. Data saturation was confirmed by the sixth focus group.

Focus groups provided an environment that allowed for in-depth input on the topics. As social pressures (such as fears of how an athlete will be perceived by a coach or teammate) and concerns about the long-term effects of concussion are known to influence concussion reporting and beliefs, we limited the number of participants to two or three in each group (Chrisman et al., 2013; Register-Mihalik, Guskiewicz, et al., 2013). Use of small groups versus in-depth interviews allowed two research staff to listen to social and peer dynamics (Draper, 2004). Based on studies examining differing concussion attitudes by gender and age, participants of the same gender and age were grouped together (Bloodgood, Inokuchi, Shawver, Olson, Hoffman, Cohen, . . . Muthuswamy, 2013; Covassin & Elbin, 2011; McDonald, Burghart, & Nazir, 2016). Participants in the focus groups were not matched by sport. The focus groups were inclu-

sive of: two groups of female athletes, ages 12-14; one group of female athletes, ages 15-18; one group of male athletes, ages 12-14; and two groups of male athletes, ages 15-18.

We employed two approaches to recruit participants for this study. First, as participants who are knowledgeable about concussion and engaged in this topic can be challenging to identify, we used purposeful sampling through the CDC HEADS UP campaign partner network (Patton, 1952). The CDC HEADS UP campaign is a concussion education and awareness campaign focused on concussion in children and adolescents. The CDC HEADS UP partner network has more than 85 organizations that help distribute concussion information across the country. The CDC HEADS UP partner network is comprised of national medical, sport, and school organizations (e.g., American Academy of Pediatrics, YMCA of the USA, National Association of School Nurses). Research staff sent email announcements to CDC HEADS UP partners. These partners in turn sent emails to invite parents of young athletes on their membership lists to voluntarily enroll their child in the study. Once identified, parents were fully involved in the screening process as the primary contact for their children. Parents indicated whether their children would be interested in participating in a focus group and answered questions from a standardized screening form that included demographic questions about their children and study inclusion criteria (such as playing at least one contact sport). Approximately 80% of participants were recruited through the CDC HEADS UP partner network. To fill participant demographic gaps, for our second recruitment approach we used a professional focus group recruitment vendor. The approach allowed us to create a more diverse study population, such as by identifying participants who did not have direct experience with concussion. The vendor recruited participants through a national panel it maintains, as well as through targeted outreach to regional and local organizations based on the same standardized screening form described above.

Research staff aimed to recruit a diverse sample with participants of varying ages, races/ethnicities, and sports played. As sport culture differs across regions in the U.S., research staff also looked to recruit athletes from each census region (Northeast, Midwest, South, and West) (U.S. Census Bureau, 2017). Recruitment efforts were more effective in southern states, likely due to the greater responsiveness of HEADS UP partners from this region, thus, a larger number of participants from southern states is included in the study. Importantly, research staff recruited participants who participated in at least one sport in which concussion risk is increased, such as soccer, football, ice hockey, and boys lacrosse (Marar, McIlvain, Fields, & Comstock, 2012; Sarmiento, Thomas, Daugherty, Waltzman, Haarbauer-Krupa, Peterson, . . . Breiding, 2019). Eight athletes played more than one sport. We excluded athletes who only played sports that did not pose a notable risk for concussion, such as rowing and swimming (Sarmiento et al., 2019). Participants involved in both non-school-based and school-based sports programs were included. None of the participants reported having had a history of concussion, although during the focus group discussions several participants shared they had a sibling or teammate who had experienced a concussion in the past. Participants were not excluded based on their demographic characteristics.

Data collection occurred via an online webinar platform and a toll-free telephone conference line. Virtual focus groups allow for a more inclusive study, facilitating the involvement of participants from a more diverse population (Rupert, Poehlman, Hayes, Ray, & Moultrie, 2017). The virtual focus groups also allowed athletes from different states to be involved and join in from the convenience of their own home. A trained moderator facilitated the discussion among participants using a standardized moderator guide (Appendix A). The moderator guide was developed based on a review of the literature (Chrisman et al., 2013; Cusimano, Topolovec-Vranic, Zhang, Mullen, Wong, & Ilie, 2017) and by three research staff who

are knowledgeable about concussion and have experience developing guides for qualitative research.

Each participant signed an assent form and their parent signed a consent form before the groups took place. Parents did not participate in the focus group discussions. At the beginning of the call, the moderator asked participants to verbally consent to participation in the discussion. To ensure privacy, the moderator used only participants' first names during the discussion. Two research staff joined the call to take notes. Prior to providing feedback to the moderator's question, each participant announced their first name. This helped ensure that notes could be attributed to the correct participant. In addition, during the focus groups, the moderator continuously offered summary statements to the participants to check that their input was captured accurately. One of the two research staff on the call helped the moderator manage administrative aspects of the focus groups (e.g., dealing with participants who did not show or arrived late, starting the recording) (Onwuegbuzie & Leech, 2009). The virtual focus groups were audio recorded for note-taking purposes. Each focus group was 90 minutes in length.

Notes-based analysis was used to analyze the focus group data. Transcripts were not developed. However, the audio recordings were referenced when needed for clarification and to verify quotes. Consistent with the Grounded Theory methodology, two authors independently reviewed all the data collected from the focus groups. Each author analyzed the data for repeated ideas, concepts, or elements they observed and listed them in a spreadsheet. This approach allowed each author to review and analyze the data separately. The two authors then discussed their findings and agreed upon emerging ideas and concepts they identified. A set of codes was created, and the two authors independently used the codes to group and extract the data and develop themes from these findings. The two authors compared and discussed their themes to determine the final set of

themes that were chosen. A third author assessed data quality and resolved any discrepancies in the coding and identified themes. The authors did not hypothesize the themes prior to data collection; the themes solely were identified based on the data collected. The three identified themes included: 1) Barriers to athletes reporting and properly managing concussion, 2) strategies to encourage athletes to report concussion symptoms, and 3) opportunities to improve communication about concussion. No coding software was used in the analysis.

The study was approved by ICF's internal Institutional Review Board. Athletes were offered an online \$20 Amazon gift card as compensation for their participation, which was emailed to them or their parents by research staff after the focus group. Contact information was stored in a secure project folder in order to communicate and follow up with participants or their parents regarding their incentive. The folder was destroyed at the completion of the study.

Results

A total of 31 athletes or parents of athletes were screened using a standardized form and 17 athletes were selected to participate in the six focus groups. The 17 athletes selected were those who best fit the inclusion criteria. Athletes who were excluded from the study either were not available during the scheduled times (10 athletes) or played sports that did not fall inside recruitment criteria (4 athletes). The average age of participants was 15. A summary of the participants' demographic information can be found in Table 1. Results are reported according to the three overarching categories recorded in the methodology section.

Table 1
Participant Demographics

| Group | Gender | Age | Sport | Census Region | | | | Race/Ethnicity |
|----------------------------|--------|-----|--|---------------|---------|-------|------|---|
| | | | | Northeast | Midwest | South | West | |
| Male athletes ages 15-18 | Male | 17 | Ice hockey, baseball | | X | | | White, non-Hispanic |
| | Male | 14 | Football, lacrosse, baseball, basketball | | | X | | White, non-Hispanic |
| Male athletes ages 12-14 | Male | 13 | Lacrosse, soccer | | | X | | White, non-Hispanic |
| | Male | 13 | Soccer, lacrosse | | | X | | White, non-Hispanic |
| | Male | 12 | Football, lacrosse | | | X | | White, non-Hispanic |
| Male athletes ages 15-18 | Male | 16 | Soccer | | | X | | Black or Black or African-American |
| | Male | 16 | Baseball | | X | | | Asian |
| Female athletes ages 12-14 | Female | 13 | Ice hockey, soccer, basketball | | | X | | White, Hispanic |
| | Female | 13 | Soccer, basketball, track | | | X | | White, Hispanic |
| | Female | 13 | Soccer | | | X | | White, non-Hispanic |
| Female athletes ages 12-14 | Female | 12 | Lacrosse | | X | | | White, non-Hispanic |
| | Female | 13 | Lacrosse | | | X | | White, non-Hispanic |
| | Female | 13 | Volleyball | | | X | | White, Hispanic |
| | Female | 14 | Soccer, basketball, volleyball, rowing | X | | | | Black or African-American, non-Hispanic |
| Female athletes ages 15-18 | Female | 16 | Basketball | | | X | | Black or African-American, non-Hispanic |
| | Female | 17 | Lacrosse, field hockey, soccer | | | X | | White, non-Hispanic |
| | Female | 15 | Volleyball | | | X | | White, Hispanic |

Barriers to athletes reporting and properly managing concussion

Participants in the focus groups recognized the seriousness of concussion, but also named several barriers to safe management of concussion. They discussed reasons why athletes might not report symptoms themselves, including 1) the lack of an understanding of signs and symptoms, 2) the social pressures they face, 3) a high level of investment and focus in the game, and 4) not thinking about concussion during play.

Unfamiliar with concussion signs and symptoms. Participants discussed they may not report symptoms simply because they are not familiar with concussion symptoms, thus, an athlete might “think nothing of the symptoms when it happens,” or believe “concussion symptoms are temporary and will go away as I keep playing.” Others described challenges with understanding the severity of the injury and the need to report concussion symptoms. One athlete explained, “Some don’t like getting checked out. They think they’re invincible.” The majority of participants commented that teammates rely on the coach to pull them out versus reporting concussion symptoms, with one athlete stating, “If the coach is letting me stay in, I’m fine.”

Facing social pressures. Participants in the focus groups discussed social pressures they face regarding concussion and how this influences their reporting behaviors. One athlete said he could imagine his teammates would “taunt those who have to sit out from concussion.” Another athlete added, “Meaner teammates wouldn’t be okay with sitting out.” The majority were concerned about being accused of faking a concussion injury, with one athlete summing up this concept by stating “teammates will think you just don’t want to play.” Participants discussed how “heroic stories about athletes” are shared and are used to set expectations for the team regarding concussion safety. One athlete stated, “Legends go around about players going back into the game,” and that going back into

the game quickly is something that is praised.

In addition to teammates, participants discussed the social pressures that could arise from the athlete-coach relationship. Two participants agreed their coaches “could get mad” if they sustained a concussion during an important game. Another participant discussed they may feel compelled to play because they don’t want to “let the coach or team down.” One participant pointed out it can be hard for some athletes to report their concussion to a coach if they don’t have a good relationship. She said, “If they don’t have a comfortable relationship with coach they might be scared to tell them.”

Strong investment in the game. The majority of participants agreed athletes may not self-report symptoms because of their investment in the game and their performance. Examples included: “fear of missing games,” “wanting to keep playing,” concern of missing “a really big game,” or “making sure parents can see you play.” One participant stated athletes just “don’t have the self-control to sit out” and that “for some people, it’s hard to pull themselves out of the game.”

Not thinking about concussion during play. The majority of participants shared that it can be difficult to keep concussion top of mind while they are playing or practicing their sport. One participant stated that, “While we’re playing, we’re not really focusing on concussion.”

Strategies to encourage athletes to report concussion symptoms

Participants shared their perspective on what they thought might encourage themselves and other athletes to report their symptoms. They shared strategies around four main ideas, including 1) delivering messages that increase willingness to report symptoms, 2) being part of a supportive team environment, 3) having a coach who creates a comfortable and secure setting, and 4) emphasizing future outcomes.

Delivering messages that increase willingness to report symptoms. Overall, the most prominent message participants wanted other athletes to hear was that concussion is a serious injury. The majority of participants commented that: “It’s not something that can be taken lightly” and “Concussions are really serious. Just like breaking a bone.” Participants in the focus group also discussed the importance of reminding athletes to sit out of play if they suspect a concussion and that reporting a concussion may help get them back into play faster. One participant said “the faster they report them, the faster they recover. [It’s] not worth finishing out that game because you could play in the next few games.” Participants shared messages they would tell their teammates or would like to hear from their teammates about reporting concussion symptoms. These messages included: concern about adverse outcomes, with one participant sharing that teammates should know that “bad things can happen.”

Participants discussed wanting to get messages about concussion from their coach that include “information about the consequences of concussion,” as well as “knowing it’s okay to report symptoms” and not to feel “rushed to come back after a concussion.” Participants agreed it would encourage concussion reporting if a coach “reassured us that they’d put someone back in the game when we are feeling better.”

Being part of a supportive team environment. Participants brought up throughout the focus groups that a supportive team environment would make them feel more comfortable reporting their concussion symptoms. One participant said, “It’s about the chemistry between all the players...that bond makes it more comfortable to look out for each other.” Another athlete added, “It makes [reporting] easier if you have a support system behind you.” Participants also agreed that it is helpful to know “teammates went through the same education and protocol you did,” so that everybody has the same knowledge about concussion. Another participant remarked that it’s always “good to hear that people are supportive of you no matter

what decision you make to go back in the game.”

The majority of participants agreed it would be best if they did report concussion symptoms for an unwilling teammate and felt this was part of being a good teammate. In one focus group, participants said they would be comfortable reporting for their teammate, because “if they were mad at me in the moment, they’d probably be happy in the long run.” One participant echoed this, saying, “I would do it to protect them, I wouldn’t want them to get hurt and lose [their] career.” Another participant said she would report a teammate’s concussion: “It’s important to look out for teammates. I’d want others to look out for me.”

Three participants had different perspectives on the issue: One participant expressed that he thought his teammate “would feel betrayed, but as much as I’d feel bad, I feel like I’d be doing what is right for him and everybody else.” He added that “you also need a stronger relationship with the person, so they know what you’re going off of and why you’re doing it.” Another participant saw the value in reporting but didn’t think she would report for her teammate: “If it’s my teammate and she doesn’t want me telling, I wouldn’t tell, it’s her choice. I’d offer to tell for her if she didn’t want to. It’s a lot easier to just get it over with than wait longer.” Another participant didn’t see the value in her teammate sitting out from practice, saying, “It’s important to participate in every single practice to get the most time possible.”

Having a coach who creates a comfortable/secure setting. Participants valued having a coach who can help create a comfortable environment for concussion reporting. The majority of participants agreed that coaches need to let their players know if they have an injury it should be top priority. One participant stated: “It’s always alright for athletes to tell their coaches how they’re feeling and that they can sit out if they need to.” One participant agreed that, “If coach has everybody’s best interests in mind, he would be okay with [someone sitting out].” The majority of

participants emphasized that a coach should tell athletes their health is a priority and “we shouldn’t play if we’re not feeling up to it.”

Emphasizing future outcomes. Throughout the groups, participants discussed the consequences of playing with concussion to both their future health and their future in their sport. The majority of participants stated that concussions “can cause permanent damage,” “things could get worse as it goes on,” and “it’s scary to hear about people getting concussions and the long-term health effects.” Participants also described the connection between concussion reporting and adverse outcomes. Participants pointed out that reporting concussion symptoms and taking time to recover is always better in the long run. Two participants noted that taking time to recover is important, saying, “If [athletes] love their sport, they should report it because it could get worse and they might not be able to play again.” In another group, a participant said, “If you want to keep playing in future games you probably want to sit out because it could get serious.”

Communication about concussion

Participants discussed places where they hear about concussion and how they prefer to receive concussion communication. Their perspective fell into five major categories, including 1) communication happens, but not among teammates, 2) leveraging context: when, how, and what information is received, 3) discussing concussion with coaches, 4) receiving reinforcement of messages from parents, and 5) receiving communication that is reactive, not proactive.

Teammates do not communicate about concussion. The majority of participants across groups expressed they did not communicate often about concussion with their teammates. One participant said the topic “just doesn’t come up,” and another athlete said, “I don’t think about it a lot or discuss with teammates.” The main exception to this was when their teammate had gotten a concussion. The majority of

participants agreed they would discuss it then. One participant shared that even in that case, the topic is not “about how they could have prevented it” and they don’t talk about it with teammates in front of adults (such as the coach or athletic trainer).

Places where athletes hear about concussion. Three participants discussed they hear about concussions in their health class, as well as from teammates and physical education teachers. While the amount and consistency of receiving information varied among the focus group’s participants, the majority agreed they would like concussion information specific to their sport, with one adding, “Knowing that someone has had it in my sport, I’d definitely pay attention.”

Discussing concussion with coaches. The majority of participants agreed they don’t hear much from coaches about concussion, especially regarding concussion prevention. When coaches do discuss concussion with their team, it often is prompted when “someone is hit hard” or if “a teammate has one.” Participants, however, expressed they would like to hear concussion messages from their coach and most would trust information coming from their coach. One participant summarized the overall feelings of a group by stating, “It wouldn’t bother me at all [to discuss concussion with my coach]. I respect my coach.” Others added, a “coach is the person to give messages,” and “I would take concussion information more seriously from the coach.”

Receiving messages from parents. Nearly all participants shared that parents do not often discuss concussion with them. However, when conversations do occur, the majority agreed that parents stress “being careful because of how serious concussions are.” Most concussion messages from parents focus on reporting symptoms and what happens if a concussion occurs. One participant summed this up by explaining, “Parents talk more about what happens and less about prevention. More about recognizing symptoms.”

Receiving communication that is reactive, not proactive. The majority of athletes commented that the coach “should say something about concussion every practice” or “at least once every two weeks.” In regard to delivering concussion messages, athletes preferred that a coach “say something, rather than give something out like a fact sheet.” Six different participants suggested their coach say something “in a group huddle, so everybody knows what to do.” The majority of participants also were eager for coaches “to give us ways to not get a concussion and ways to focus on that during the game.”

Discussion

When a concussion does occur, one of the most important actions young athletes can take is to report their symptoms immediately to a coach, athletic trainer, or parent. Athletes who do not immediately report their concussion symptoms and continue playing can risk prolonging their recovery and/or more serious injury (Meehan, Mannix, O’Brien, & Collins, 2013). Athletes in our study recognized the seriousness of concussion and were concerned about the potential for long-term effects. Still, across the focus groups athletes described several barriers that interfere with their willingness and readiness to report concussion symptoms, including: being unfamiliar with concussion signs and symptoms, perceived pressure from teammates, concerns of interference concussion reporting can have on gameplay, and a lack of focus on concussion during play. To help support concussion reporting, athletes expressed an eagerness to get messages about concussion from coaches, parents, and teammates.

Athletes in this study stated they may not report concussion symptoms because they are not familiar with them. While most athletes have heard about concussion (Bloodgood et al., 2013), other research also suggests athletes may have difficulty identifying concussion signs and symptoms (Chrisman et al., 2013; Register-Mihalik, Guskiewicz, et al., 2013). Concussion symptoms can overlap with other com-

mon conditions that can happen during play, such as fatigue and dehydration (Chrisman et al., 2013). This may make it challenging for athletes to feel comfortable self-identifying concussion symptoms for fear of being incorrect or thinking “symptoms are temporary and will go away” and may explain the preference of athletes in this study for their coach to identify their symptoms versus wanting to report how they are feeling to their coach.

Findings from our study parallel those of previous studies that also have documented that athletes face various social pressures that affect their concussion-related behaviors (Chrisman et al., 2013; Register-Mihalik, Guskiewicz, et al., 2013). Across the focus groups, the relationships between athletes with their teammates were reported as important factors that would increase or decrease their comfort in reporting a concussion. For example, many athletes in our study emphasized their belief that having supportive teammates makes it easier for athletes to report concussion symptoms and sit out of play while they recover. While there was some hesitancy among participants, the athletes in our study mostly agreed they had a responsibility to report concussion symptoms on behalf of a teammate and they would expect their teammates to do the same for them.

Kroshus et al (2016) also examined the role of teammates and concussion reporting behaviors. In this study, authors found that athletes who felt their teammates held positive views on concussion safety were more likely to state they would encourage their teammates to report their concussion (Kroshus, Garnett, Baugh, & Calzo, 2015). Research on interventions that incorporate peer-to-peer models to promote concussion safety are underway (Kerr et al., 2018). Future studies also could explore educational strategies to promote verbal communication about concussion among coaches and teammates. Current concussion education efforts may consider adding in messaging on the importance of ongoing communication by coaches and the role teammates play in influencing

concussion reporting and care-seeking behaviors.

Athletes in our study also expressed the environment created by coaches influences their reporting behaviors. We found that athletes perceive coaches to have influence on concussion reporting behavior, both positively and negatively. Athletes shared that if coaches delivered supportive and comforting messages to athletes, athletes would be more willing to sit out from play and take time to fully recover. They also respect and trust their coaches and believed they would give them credible information about concussion. Conversely, if athletes were scared to tell their coach about concussion symptoms or feared their coach would get mad at them, they were less likely to report their symptoms. While athletes described that their coaches communicate with them about concussion reporting throughout the season, athletes shared that their coaches don't often discuss concussion prevention. Athletes expressed they were interested in learning more from their coaches about how to prevent concussion and were open and willing to discuss concussion prevention with their coaches. Based on these findings from this study, as well as similar studies, expanding concussion education messages comprised of positive supportive messages, as well as those tailored to concussion prevention strategies, may be beneficial (Kroshus et al., 2015; Register-Mihalik, Linnan, et al., 2013).

An unexpected finding of this study was that athletes were concerned about protecting their futures: both their future health and safety and their future potential athletic careers. Athletes were aware of the potential long-term and even life-threatening consequences of concussion and did not want to put their health in jeopardy. Some participants knew teammates who experienced long-term consequences of concussion and realized that not reporting concussion symptoms could contribute to a longer recovery. Athletes also believed that athletes who did not report their concussion symptoms could risk their future ability to play their sport. These findings point to a

potential opportunity for coaches to engage and connect with athletes about concussion and the importance of reporting possible symptoms to protect their future health.

While recent studies have found that coaches are knowledgeable about concussion and take their role seriously, coaches may experience challenges recognizing more subtle signs of concussion (Naftel, Yust, Nichols, King, & Davis, 2014; Sarmiento, Daugherty, & DePadilla, 2019). In addition, coaches report that removing athletes from play is complex because of the importance of the game, difficulty recognizing the injury, and internal and external pressures (Sarmiento et al., 2017). Access to athletic trainers can help improve concussion identification on the sideline (Kroshus, Rivara, Whitlock, Herring, & Chrisman, 2017). Athletic trainers can help relieve coaches of the sole responsibility for concussion identification and can monitor athletes on the sideline when they are injured (Kroshus, Rivara, Whitlock, Herring, & Chrisman, 2017). However, among school-based sports, a little more than one-third (37%) of public high schools have access to a full-time athletic trainer (Broglia et al., 2014). Similarly, only about one-third of respondents in a survey of youth sports coaches indicated they have access to an athletic trainer or other healthcare provider at some or all youth sports games and practices (Sarmiento et al., 2019). Future studies could assess the association between access to an athletic trainer and the amount of communication coaches have with athletes about concussion safety.

Overall, athletes in this study reported their parents are concerned about concussion. However, participants reported their parents did not provide specific information to them about how to prevent concussion (Sarmiento et al., 2017). Previous research suggests that parents may lack the confidence in their ability to influence their athlete's concussion safety behaviors and may believe there is little they can do to prevent concussions from happening to their child. Parent-athlete communication about concussion is

more common when an athlete has a history of concussion or when parents perceive their child to be at higher risk of getting a concussion (Kroshus et al., 2018). Still, there even is uncertainty among experts about how to and what to educate parents about concussion (Kroshus et al., 2018). Future studies could explore the information needs of parents and identify effective concussion education programs designed to equip parents with resources to communicate concussion prevention information to their athletes. In addition, an examination of whether athletes proactively talk with their parents about concussion and if they seek information about concussion from their parents may be beneficial.

Practical Implications

Changing cultural norms about concussion and concussion reporting among athletes is an ongoing challenge. Current educational programs and policies focus primarily on improving concussion awareness and knowledge among coaches and athletes and have had little to no impact on concussion reporting by athletes (Kerr et al., 2014; Rivara et al., 2014; Sarmiento et al., 2017). Building an evidence-base for strategies to improve concussion reporting likely will require a multi-pronged approach that includes educational, programmatic, policy, and environmental components at the team and sports program level (tailored to the needs of the audience) and emphasizes changes in athletes' attitudes and social norms about concussion (Kerr et al., 2014; Kroshus et al., 2015; Kroshus et al., 2017; Wallace, Covassin, Nogle, Gould, & Kovan, 2017).

This study explores a unique area of concussion research by focusing on opportunities to improve coach-athlete communication about concussion (Kroshus, Gillard, Haarbauer-Krupa, Goldman, & Bickham, 2016) and factors related to athletes' readiness to report concussion symptoms. The qualitative approach used allowed for in-depth discussions. As such, findings from this study outlined several perceived barriers among athletes regarding concussion

reporting. Some health behavior theories suggest that an individual's views and perceptions are strong indicators of determining health behaviors (Glanz, Rimer & Viswanath, 2008; Rogers, 1975; So, 2013). One such theory is the Health Belief Model (HBM). The HBM was created by the U.S. Public Health Service to better evaluate programs aimed at improving positive health behaviors, such as preventive actions (Glanz et al., 2008). Constructs in the HBM include: cues to action (i.e., this makes me want to take action, feel ready); perceived benefit (i.e., doing this would help reduce the likelihood of this happening to me); perceived severity (i.e., this could have serious consequences); perceived barriers (i.e., taking this action has greater benefits than the anticipated barriers); self-efficacy (i.e., this is something I am confident I can do) (Glanz et al., 2008). Concussion education efforts may benefit from using constructs of the HBM to address athletes' self-efficacy, as well as their perceived susceptibility and barriers (such as those identified in this study), to help promote concussion reporting behaviors.

Limitations and Directions for Future Research

This study is subject to limitations. First, this study was not large or diverse enough to allow the findings to be generalizable to the larger population of young athletes. Second, this study included male and female athletes who participated in a range of sports. However, due to the small sample size, no analysis was conducted to determine differences in perspectives or experiences by age, gender, or sport. Third, while this study included athletes from every region of the U.S., no analysis was conducted by region to identify geographic differences among participants' responses. Fourth, findings from this study are based on reported behavioral intentions related to real-life scenarios; actual behavior may not be consistent with reported intentions due to outside influences not present in the research setting, such as loss of playing time due to injury, spectator reactions, etc. Educational interventions and prevention efforts should take

into account the various social and environmental factors that may influence athlete behavior. Future studies could explore variations in athletes' perceptions and experiences with concussion by sport, including school-based and non-school-based sports, and demographic factors including geographic region, rurality, age, gender, and income. Finally, given the public and media attention on sports concussion, participants may have felt the need to answer questions in a way they thought would be acceptable to the researchers who observed the focus groups.

Despite being concerned about the potential effects of concussion, athletes in our study described barriers that interfere with concussion reporting, including: being unfamiliar with concussion signs and symptoms, perceived pressure from teammates, concerns of interference that concussion reporting can have on gameplay, and a lack of focus on concussion during play. To help address these, participants expressed an interest in getting messages about concussion from coaches, parents, and teammates. These findings suggest that concussion education programs can consider promoting messages for coaches to deliver to athletes about concussion prevention strategies and the benefits of concussion reporting on an athlete's long-term health.

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