

A Qualitative Analysis of Concussion-Reporting Behavior in Collegiate Student-Athletes With a History of Sport-Related Concussion

Michelle L. Weber Rawlins, PhD, ATC*; Cailee E. Welch Bacon, PhD, ATC*†; Phillip Tomporowski, PhD‡; Jennifer L. Gay, PhD§; Laura Bierema, EdD||; Julianne D. Schmidt, PhD, ATC¶

*Department of Interdisciplinary Health Sciences and †School of Osteopathic Medicine in Arizona, A.T. Still University, Mesa; ‡Departments of Kinesiology; §Health Promotion and Behavior; and ||Lifelong Education, Administration, and Policy and ¶Concussion Research Laboratory, Department of Kinesiology, University of Georgia, Athens

Context: Many survey-based methods have been used to explore concussion-reporting behavior. However, because the decision to report or conceal a concussion is likely multifactorial, this may narrow the findings, as the surveys were largely designed by the researchers.

Objective: To explore student-athletes' perspectives regarding factors that may influence the reporting of sport-related concussion.

Design: Qualitative study.

Setting: National Collegiate Athletic Association Division I athletics.

Patients or Other Participants: We conducted 17 semi-structured interviews with student-athletes who had sustained 1 or more concussions while attending a large university (men = 4, women = 13, age = 20.9 ± 1.3 years).

Data Collection and Analysis: After data saturation and member checks, a 5-cycle analytic process was completed: topical review, literature review, data collection and summarizing using a codebook developed by a 3-person research team, linking of findings to current research, and final interpretations.

Results: We discovered 3 themes. Participants discussed concussion perceptions by describing their understanding of a concussion, their own injury experiences, and their perceptions

of symptom severity and duration. Regarding reporting behavior, participants described an order of individuals with whom they would speak, symptoms present in order to report (eg, feeling different from normal), immediate reactions, and influential factors for mitigating short- and long-term consequences. Lastly, participants discussed the value of support systems, such as how coaches can both positively and negatively influence reporting and athletic trainer involvement.

Conclusions: Participants often drew from their own concussion experiences in naming common concussion signs and symptoms. Additionally, they indicated that both short- and long-term health consequences influenced and deterred their seeking care and that their support systems, including coaches and athletic trainers, played a role in their concussion experience. Research is needed to determine if using student-athletes' own words to describe a concussion and incorporating student-athletes' support systems, especially coaches and athletic trainers, is effective in increasing concussion reporting.

Key Words: mild traumatic brain injuries, concussion disclosure, interviews, qualitative research, concussion care seeking

Key Points

- We identified 3 main themes regarding concussion-reporting behavior: concussion perceptions, reporting behavior, and support systems.
- Participants often drew from their own concussion experience to accurately name common concussion signs and symptoms. They also indicated that both short- and long-term health consequences influenced their reporting behavior.
- Developers of concussion-education interventions should consider adopting student-athletes' own words to describe a concussion and involve individuals within a student-athlete's support system, especially coaches and athletic trainers.

Approximately 50% of sport-related concussions go unreported,^{1–3} and not seeking medical care after a concussion may lead to a greater symptom burden and prolonged recovery.^{4,5} Researchers^{1,3,6,7} have used survey techniques to better understand how a wide

array of factors influence reporting behavior after sport-related concussion. Factors examined have included how much athletes know about a concussion, how serious they think the injury is, what they perceive others will think if they report a concussion, and not wanting to be removed from a game or practice.^{1–3,7,8} These factors have been explored in an effort to explain concussion reporting but

This research was conducted at the University of Georgia.

may not fully do so, likely because the behavior is multifactorial.

Theory-based survey tools are useful in explaining behavior. However, they may narrow researchers' focus in examining only specific variables instead of factors that influence behavior as a whole. In addition, sport-related concussion reporting has been previously investigated^{1,3,6,9} using researcher-derived responses instead of participant-derived responses. Survey tools developed by researchers have mainly been used in data collection,^{1,3,6,7} which has resulted in a top-down approach in which the researcher determines specific, outlined responses.

A bottom-up approach in which the participant describes the processes for the researcher is needed because a complicated array of factors likely influences concussion reporting. Concussion-education efforts that ignore the perspective of the target audience may not be effective in improving concussion reporting. Therefore, we aimed to explore student-athletes' perspectives regarding factors that might influence the reporting of sport-related concussion for those with a concussion history.

METHODS

Design

We used a hermeneutic phenomenologic design in order to study lived experiences. A concussion is experienced differently by different people, but these differences have not been examined using a hermeneutic phenomenologic philosophical framework. Lived experiences before and after concussion influence whether student-athletes report concussions to the appropriate personnel.

Participants

Student-athletes from a large university were invited by email to participate in a semistructured interview via 2 methods in fall 2018. In the first method, each student-athlete with a concussion sustained at the institution was assigned a number based on last name alphabetical order. Four participants at a time were randomly selected using a random number generator, and then snowball sampling was used. Identified student-athletes were initially contacted via email on Monday mornings, with a follow-up email sent the next Monday. During the interviews, participants were asked to identify 2 other student-athletes who might agree to be interviewed. Those student-athletes were then invited to participate. In the second method, student-athletes were identified for participation if they sustained a concussion in the fall of 2018. Because snowball sampling resulted in a low number of participants, we returned to and relied heavily on random purposeful sampling. Random purposeful sampling was initially used to include a wide range of concussion-reporting experiences. Interviews were completed and recorded with 17 participants (44 initial emails sent, recruitment rate = 17/44 [38.6%]).

Instrumentation

The lead researcher (M.L.W.R.) developed the demographic form and interview script to provide broad, open-ended questions regarding concussion reporting (Table 1). Face and content validity were assessed by the 6 members of the research team and 1 reviewer independent of the

Table 1. Interview Script^a

Interview Question
1. To begin, please tell me about your career as a student-athlete at [the institution].
a. Which sport do you participate in?
b. How long have you been playing that particular sport?
2. Describe what the term <i>concussion</i> means to you.
a. Does a concussion differ from a <i>bell-ringer</i> or <i>ding</i> ? If so, how?
3. On the demographic questionnaire, you indicated that you had personally experienced a [concussion] and/or [bell-ringer/ding]. The following questions will be about your experience. What went through your head immediately after your [concussion] and/or [bell-ringer]?
a. What led you to believe it was a [concussion] and/or [ding]?
b. Did you report the injury? To whom? How long after impact?
c. Why did you choose to report or not report the injury?
d. Do you think you were treated differently after injury?
i. Family, friends, teammates, coaches
If participant indicates that more than 1 concussion/bell-ringer was sustained, the following questions will be asked: "Can you describe each of your concussion experiences?"
a. What thoughts crossed your mind immediately after your [concussion] and/or [bell-ringer]?
b. For each concussion, what led you to believe your injury was a concussion?
c. Did you report each injury? To whom? How long after impact?
d. For each concussion, why did you choose to report or not report the injury?
e. Do you think you were treated differently after the injury?
i. Family, friends, teammates, coaches
f. (If participant reported experiencing multiple concussions and bell-ringers) How did your concussion differ from the bell-ringer or ding?
4. What are your thoughts regarding concussion reporting?
a. Why would individuals report a concussion?
i. Long-term health consequences (eg, dementia, CTE [chronic traumatic encephalopathy])?
ii. Short-term health consequences (eg, delayed reaction time, impaired balance)?
b. Why would someone not report their concussion?
i. Desire to continue playing?
ii. Not knowing it was a concussion?
iii. Did not want to let teammates/coaches down?
iv. Did not think it was a serious injury?
5. The following questions ask you to describe a hypothetical situation. If you suspected you might have a concussion next week, describe how you would approach the situation.
a. What thoughts would go through your mind?
b. What symptoms would lead you to believe you had a concussion?
c. Whom would you report your injury to?
d. How would your answer change if you sustained a concussion during a practice? Game?
e. How do you think your friends/teammates/coach would respond?
6. I am going to start this sentence and would like you to finish it: "When I experience possible concussion symptoms, I..."
a. What led you to that choice?
b. What factors would influence whether you report or do not report an injury?
7. Is there anything else you would like to add about concussion reporting?
8. Are there any questions or topics I have not asked that you would like to discuss?

^a Instrument is reproduced in its original format.

team; the latter was an expert in qualitative methods but not in concussion. As suggested by Suzuki et al,¹⁰ the interview consisted of introductory questions (items 1 and 2), specific questions related to the research topic at hand (items 3–7), and closing questions that addressed any areas missed (items 8 and 9). The design of the semistructured interview allowed the investigator to ask specific, rehearsed questions as well as probing questions when warranted. Four pilot interviews were conducted but resulted in no changes to the interview script.

Procedures

The emails initially sent to potential volunteers contained a brief introduction to the study and an invitation to participate. If the student-athlete indicated a willingness to participate, the lead researcher and volunteer agreed on a meeting time. Interviews took place in a convenient location for the student-athlete. For student-athletes who sustained a concussion during the fall of 2018 and were recruited during a postinjury evaluation, we conducted the interviews at the end of their return-to-play concussion assessment.

Each interview lasted approximately 25 minutes and began with a welcome, brief description of the study, and introduction of the institutional review board's approved consent form. The lead researcher conducted all interviews. Audio recordings of the interviews were captured using a computer recording system. Interviews were conducted until data saturation was achieved. Once data saturation was believed to have occurred, the lead researcher discussed the responses with additional research team members to ensure that saturation was, in fact, achieved.

Data Analysis and Management

Audio recordings of the interviews were transcribed by a professional transcription company (Rev.com, San Francisco, CA). The lead author read and listened to the transcripts to ensure accuracy. The study process incorporated data analysis, which was conducted using a 5-cycle process as described by Anderson¹¹ and Wertz et al.¹² In cycle 1, the topic was clarified via an introduction for the research team and readers. Cycle 2 consisted of a view through the initial lenses of the topic in the form of a literature review. Cycles 1 and 2 were completed as described, and the extensive literature review was conducted by the lead researcher.

In cycle 3, the data were collected and summarized. Three researchers (certified athletic trainers with expertise in concussion and previous qualitative experience) used Atlas.ti (version 8.4.0; Scientific Software Development GmbH, Berlin, Germany) to identify meaningful units as described by Wertz et al.¹² In general, a content analysis was completed to examine the narratives provided by the participants.¹³ Four transcripts were first read by 3 research team members. The research team then met to discuss potentially meaningful units and create an initial codebook.¹⁴ Three transcripts were reread to identify meaningful units as determined by the group and outlined in the initial codebook. The team then met again to discuss the process of coding and create a final codebook. The lead researcher used the final codebook to code all transcripts. Cycle 4 involved focusing on “transforming and revising

interpretive lenses”^{11(p 254)} and relating our findings to those of other research examined in cycle 2. Lastly, cycle 5 included final interpretations and integrating the findings into theory building. In this step, the meaningful units were tied into the conceptual framework as a whole. Cycles 4 and 5 are completed in the Discussion section of this article.

During cycle 3, we completed the data quality assessment of trustworthiness. Data credibility was evaluated via member checks.¹⁵ To complete member checks, we emailed each student-athlete his or her interview transcript and allowed 1 week for review. Participants were instructed not to change the transcript, but they could add to any areas they wished to describe further. Participants were made aware of this process at the end of their interview. The emails stated that if we did not hear from them within 1 week, we would assume they had no additional comments or edits to their transcript. Four participants confirmed that they did not have any changes to their transcripts and the others did not respond.

Dependability and confirmability were confirmed with an external reviewer.¹⁵ The external reviewer received 3 uncoded transcripts, the corresponding 3 coded transcripts, the final codebook, and the interview guide. The reviewer then read all of the materials and determined if they agreed with the final codebook (ie, the external reviewer agreed with the final codebook).

RESULTS

Seventeen participants were interviewed before data saturation occurred. Participant demographics are supplied in Table 2. From our interview analysis, 3 overall themes were discovered: (1) concussion perceptions, (2) reporting behavior, and (3) support systems. Subthemes associated with each theme and additional supporting evidence are presented in Table 3.

Concussion Perceptions

Perceptions regarding concussion understanding, participants' own injury descriptions, common concussion symptoms, and symptom severity and duration were discovered. For the subtheme of concussion understanding, participants had both correct and incorrect understandings of the injury. For example, most participants fairly accurately described a concussion as “It's an injury to the brain that can affect some cognitive processes.” However, fewer people did not understand what a concussion is. One stated, “It's like a head injury. I actually don't really know much about it” and “We're educated on it a lot, but I don't know. It's hard to put into words.”

Many respondents described common signs and symptoms of a concussion, such as headache, nausea, confusion, sensitivity to light, dizziness, forgetfulness, blurred vision, pressure in the head, sensitivity to noise, disorientation, irritation, difficulty sleeping, “not feeling right,” “feeling off,” fatigue, and loss of concentration. Some participants also noted less common experiences:

I couldn't really speak. So, they had to take me to the emergency room. So, that was probably the worst one. I was okay, but they had to run a bunch of tests and, like, you would think so hard, but the words, you couldn't get them out of your mouth. It was scary.

Table 2. Participant Demographics (n = 17)

Variable	Results Mean ± SD
Age, y	20.9 ± 1.3
Length of recovery, d ^a	29.14 ± 13.68
	No. (%)
Sex	
Men	4 (23.5)
Women	13 (76.5)
Race, ^b No. (%)	
African American or Black	1 (5.9)
American Indian or Alaska Native	1 (5.9)
Asian	0 (0)
Native Hawaiian or Pacific Islander	1 (5.9)
White	16 (94.1)
Unknown	0 (0)
Ethnicity	
Hispanic or Latino	2 (11.8)
Not Hispanic or Latino	14 (82.3)
Unknown	0 (0)
Missing	1 (5.9)
Primary sport	
Baseball	1 (5.9)
Cheerleading	3 (17.6)
Cross-country/track	3 (17.6)
Equestrian	3 (17.6)
Football	2 (11.8)
Gymnastics	1 (5.9)
Soccer	2 (11.8)
Swimming/diving	1 (5.9)
Volleyball	1 (5.9)
Sport eligibility completed, y	
0	1 (5.9)
1	2 (11.8)
2	5 (29.4)
3	4 (23.5)
4	5 (29.4)
Concussion-history variables	
Previous concussions (n = 17)	27–28 ^c
1 concussion	11 (64.7)
2 concussions	2 (11.8)
3+ concussions	4 (23.5)
“Bell-ringers” or “dings”	10 (58.8)
Previous “bell-ringers” or “dings” (n = 17)	13–14 ^c
1	3 (17.6)
2	2 (11.8)
2–3	1 (5.9)
3+	1 (5.9)
“Many” or “a lot” or did not know	3 (17.6)

^a Based on 7 events sustained at the current institution by 6 individuals; data from 11 were missing.

^b Does not total 17 participants or 100% because participants could indicate more than 1 race.

^c One participant gave a range of concussions, bell-ringers, and dings sustained.

Other participants also indicated, “And then [it] just disorients your body as a whole” and “feeling weird.”

For the subtheme of severity and duration of symptoms, when asked to describe the difference between a concussion and “bell-ringer” or “ding,” respondents often perceived a difference in the severity or duration of symptoms. For

example, 1 person stated, “I think a bell-ringer or a ding would be maybe more short-term symptoms, like a headache for a little bit, maybe a little dizziness, but maybe wouldn’t last quite as long.”

One individual said,

I think the symptoms lasted longer, and I think the symptoms were more severe. It wasn’t just a headache that lasted an hour; it was a headache that lasted 2 to 3 weeks. The bell-ringer, I didn’t pass out or vomit or have to go to the urgent care.

During the interviews, many participants relied on descriptions of their own injury experiences when trying to provide a concussion definition. A respondent commented,

Just headaches, dizziness. . . Let me think. Blurred vision. I’m trying to think what I had. . . And things that get worse with physical or mental activity. I feel like headache and dizziness are probably the 2 biggest ones for me.

Another person remarked, “I also didn’t know concussions existed at that point [before own concussion].”

Reporting Behavior

A second theme was reporting behavior, with subthemes of reporting order, symptoms present in order to report, immediate reactions, positive and negative influential factors for mitigating short-term consequences, and positive influential factors for mitigating long-term consequences. For the reporting order subtheme, individuals often listed the order in which they would report a concussion, such as, “Well, I would go to my [athletic] trainer first and foremost” or “[go to the athletic] trainers, and then tell coach, and then go see a doctor.”

In the second subtheme, participants said a variety of signs and symptoms would need to be present for them to report a sport-related concussion. Some described more global changes, such that if they “felt any difference [sic] than I normally would,” then they would report their injury. Others characterized the severity and length of symptoms that would need to be present:

If I were having symptoms, they would probably have to be pretty severe and lasting for a couple of days. I’d probably wait a few days, like if I had a headache and some nausea, dizziness, sensitivity to light. If I was experiencing that stuff, it would have to be pretty bad and last for a couple [of] days.

Under the subtheme of immediate reactions, they also noted what they would do first after sustaining a sport-related concussion. Some athletes would report a possible sport-related concussion if the situation was appropriate: “If I didn’t have a meet, if the season was over, for sure then I would say something, no matter what.” Others would continue to play with concussion symptoms: “I’d probably finish practice unless I was, like, unconscious.”

For the next subtheme, a variety of short-term influential factors would cause a participant to report or conceal a

Table 3. Concussion-Reporting Themes and Subthemes

Theme	Subtheme	Additional Evidence
Concussion perceptions	Concussion understanding	“Well, in the past, I thought it was just getting hit in the head. When I think of concussion, I think just precautionary; there’s not actually something that happens, but I saw something on, I think it was Twitter. My cousin played football here, and he got so many concussions, but it was like a diagram of the skull with the top taken out, and it was the brain, and they showed what it looked like of the brain hitting off the sides, and at that point I was like, ‘Oh, my gosh. Whenever someone gets hit the head, I’m telling everyone because that’s freaky.’ So, I think that in my mind now, it’s when your brain hits off the skull. But I’m not sure.”
	Own injury description	“It is a really weird feeling when you have a concussion. And you’re like, ‘I feel almost out of control of my body.’ At least that’s how I felt. So I think it’s like a safety thing. Being like: ‘Something’s wrong with me.’”
	Concussion symptoms	“Not being able to do as well in the classroom”
	Severity and duration of symptoms	“I think I evaluate them based on other concussions I’ve had. So how severe it is, what the symptoms are, maybe even how long it lasts. And then based on that, I’ll decide if I should tell somebody like an [athletic] trainer or just continue to do a sport.”
Reporting behavior	Reporting order	“Go straight to my athletic trainer and tell her what I’ve experienced and that I might have gotten a concussion due to this activity that I was doing and explain the activity.”
	Symptoms present to report	I would say something after the race unless it was really bad; it’s like I don’t know if it was, like, something actually severe where I was, like, blacked out or was, like, extremely nauseous and dizzy and couldn’t stand up or something, then I would say something, but if it was moderate symptoms, just like a headache, then I wouldn’t say anything.”
	Immediate reactions	“I freak out. I panic a little bit. And then I give it a minute or just give it some time and then report it typically.”
	Influential factors to mitigate short-term consequences (positive and negative)	Positive: “Just because [of] the team aspect and not wanting to let anybody down or anything like that, I guess. It’s easier to put your team first, especially in the moment.” Negative: “Well, just it’s, like, time that you have to, like, put on your schedule and you’re already, like, really busy, so, like, you don’t wanna have to, like, spend the hour to go to [testing center] and do the test, so yeah.”
Support systems	Influential factors to mitigate long-term consequences (positive)	“It’s very important for yourself to report it because in the long run, it could cause issue[s].”
	Coach involvement (positive and negative)	Positive: “I think that they’d all be worried and really supportive and just encouraging me to take care of myself to get better as soon as possible. Not do anything that could make it worse.” Negative: “I think a lot of people don’t wanna report for the reason, like, that I kind of talked about with coach not really liking us missing practice.”
	Team dynamic	“Most of them are pretty supportive, but I think there was definitely a little bit of skepticism about the situation because, again, it’s not like an injury that you can see. I think people are skeptical until I was failing the test. Then they were like, ‘Oh, wow. Maybe this actually is a real thing. Maybe you are feeling bad, and something really did happen.’ For the most part, like I said, they were pretty supportive. But I think it’s hard for people who don’t experience them to kind of understand what you’re going through.”
	Friends and family	“Parents are very encouraging, were very encouraging throughout it. Of course, they want you to play, they want to see you play; it’s your last spring. But yeah. They were very encouraging about the whole situation, and like, you need to do whatever you can do to get better.”
	Athletic trainer involvement	“My [athletic] trainer[s] was extremely helpful, both of them. I had 2 different [athletic] trainers during my concussions, and they made it really easy’.

Downloaded from <http://meridian.allenpress.com/jat/article-pdf/56/1/92/27340021/1062-6050-56-1-92.pdf> by guest on 04 February 2021

concussion. For example, 1 person said, “it could not benefit your team if you go on in and you try to play and you can’t play your 100%, so that could influence yourself and your teammates as well.” This was a positive example of a short-term consequence if a concussion was reported.

Another individual said:

But I wouldn’t have been able to, like, compete to my full potential anyway, so I feel like if you actually have a concussion, sitting out is going to benefit you, because even if you’re out there, you’re probably not going to be performing at your best anyway, so you might get benched anyway, even if you are not reporting it.

Both examples highlighted that student-athletes considered it important to be an effective teammate and how sport-related concussions might affect their reporting decisions. Conversely, many respondents depicted negative consequences to reporting a concussion and how those could influence the decision to report or conceal. Examples included “they don’t wanna go through the concussion protocol,” “they see it as more of a waste of time,” and “I might miss a couple [of] games.” In order to participate, one athlete even lied when describing symptoms:

I will admit, I did have a competition that I’ve been training for my whole life. ...Not really gonna lie, but I did say that I was feeling a lot better than I actually was at the time so that I could get to go to [the competition], which I did end up getting to do. I do think it was maybe a little early, but luckily, I mean, nothing happened. It’s not like I hit my head, but I guess it was lucky because the big thing that the doctor talked about was the second concussion that you get after. So if he were to put me back in the [competition] too soon, and I were to [fall], it could be life threatening. So luckily that didn’t happen, but I do think it was a little soon. So I do understand why people would be less inclined to report it, because that’s their career, and that’s what they love doing. You put so much work into something, and then you bump your head, and all of a sudden, you’re kind of put out of everything.

In conjunction with short-term influential factors that would cause a person to report or conceal a concussion, long-term influential factors were identified as a subtheme, including the potential long-term health consequences:

Concussions can affect you in the long run, and I think that was the main point for me is that soccer’s not going to be my future. And so, yeah, even though I might miss a couple [of] games, I don’t want this head injury that I ignored in the present to affect me in the future.

Conversely, one individual spoke to how concussions could hinder the longevity of a sports career: “And as far as male athletes who are looking for a career in a sport, the last thing they’re trying to do is report a concussion.”

Support Systems

The final theme identified was the support system, with the subthemes of coach involvement, team dynamic, family

and friends, and athletic trainer involvement. Many participants discussed coach involvement in sport-related concussion management in both positive and negative lights:

The coaches, I think my head coach was very understanding. He said if you get hit in the head and you feel that you have a concussion, and the testing proves in that sense, then of course you need to sit out and heal yourself before you come back to the game.

However, some athletes felt pressure to return to their sport:

After a week, [coaches] were asking questions like, “How are you feeling? You look good. When are you going to take the test again? We need you back.”—[that] type of a thing. I just felt like I needed to get going, even if I maybe had some slight symptoms still.

Others simply said they would not report “’cause you don’t wanna disappoint your coach.”

Certain individuals addressed how the larger team dynamic, the second subtheme, affected concussion reporting and mentioned their supportive team environments: “[My teammates were] very caring but didn’t treat me, like, in a bad way, just, like, very worried and caring and made sure I was feeling okay, everyday feeling better.”

Others had very different experiences:

I just remember the team. . . It wasn’t a very welcoming environment. From the get go, it wasn’t, I don’t think so, for me personally. I’m sure a lot of different people have different opinions and stuff, but for me, it just wasn’t very welcoming from the get go, and then I got my concussion, and it was almost like I was ... I don’t know. Almost like a cast out kind of. I feel like people kind of talked behind my back, like “Oh, is she faking this because she didn’t want to go to workouts?” which totally was not true, because I was having to go to all these concussion reports. I was having to do all these tests. I had to go to the doctor every week. I didn’t want to do that. So that was just really difficult, and then when I eventually got back into practices and stuff, and they expected me to be at my full working potential, automatically lifting really heavy weights that I haven’t been lifting in a couple months. And if I wasn’t, it would be “Oh, you’re not trying hard enough,” which was just not true, because I was trying as best as I could.

Family and friends also played a role in student-athletes’ concussion recovery and was another subtheme. Fortunately, many commented that their parents were mostly supportive and cared about their overall well-being. A participant explained:

My parents, on the other hand, they were like, “You need to treat this, and you don’t need to worry about playing time or whatever. We’ll watch you when you come back.” My parents were definitely okay with it and what not. They had to be okay with it because it happened, but they never gave me a hard time.

Another person noted, “I think that they’d [family and friends] all be worried and really supportive and just encouraging me to take care of myself to get better as soon as possible. Not do anything that could make it worse.”

Respondents also discussed athletic trainer involvement in concussion reporting:

I would go to my [athletic] trainer first and foremost. And that’s when she does the sheet and reads off numbers for me to reiterate to see if I’m in the right mindset, if maybe I did have a concussion or not. So, report to her, and then if she thinks it’s something serious, then I would do whatever I needed to do to treat that concussion.

Another athlete stated:

And I definitely would go about kind of going to my [athletic] trainer to be like, “This is what I’m feeling.” I don’t really know what I’m supposed to do because I feel like a lot of those situations, like I don’t know what I’m supposed to do, and I just kind of tell somebody this is what’s going on right now with my head, my body. What do I have to do?

DISCUSSION

These respondents identified common concussion signs and symptoms, but we determined that concussion-reporting behavior was multifactorial and involved many individuals, especially coaches and athletic trainers, and that both short- and long-term health consequences influenced or deterred student-athletes who considered reporting a concussion. We identified 3 overall themes: concussion perceptions, reporting behavior, and support systems.

Concussion Perceptions

Regarding concussion perceptions, some participants were able to accurately describe a concussion, whereas that was difficult for others. Although many definitions of a concussion exist,^{16–18} and memorizing a concussion definition is neither feasible nor required for student-athletes, our respondents had completed concussion education in which a definition was given.^{19,20} Additionally, each person in this study had experienced a sport-related concussion and completed a symptom checklist regularly after injury. Therefore, the inability to describe or define a concussion was noteworthy.

The student-athletes cited many concussion signs and symptoms. However, few individuals identified a broad range of symptoms in a way that accurately represented the diversity of postconcussion symptoms. Some described concussions as “feeling off” or “felt weird.” Therefore, developers of interventions for sport-related concussion education might consider using the student-athletes’ own words when describing a concussion to help the athletes recognize their symptoms.

Participants often discussed symptom duration as important in determining if they would report or conceal a potential injury. Concussion definitions do not detail a

required symptom duration for diagnosis. McCrory et al¹⁸ posited that concussions typically involve short-lived neurologic impairments that can resolve spontaneously. If suspected, a concussion should be reported as soon as possible based on the mechanism and symptoms present, regardless of the symptom duration.¹⁶ The urgency of reporting sport-related concussion symptoms, regardless of severity and duration, should be addressed in concussion education.

Describing concussions as “bell-ringers” or “dings” is not recommended, as these colloquial terms minimize the injury.¹⁶ Many of our respondents and those of Lininger et al²¹ still recognized these terms and described bell-ringers or dings as “less severe” than concussions. Valovich McLeod et al²² found differences in injury-reporting rates when athletes were asked “How many concussions have you sustained?” versus “How many bell-ringers/dings have you sustained?” Health care professionals should avoid using colloquial terms for concussions; yet they should understand that many misconceptions persist regarding the use of concussion-related terms. At the very least, student-athletes should be advised to seek a health care provider’s assistance in determining whether the presenting symptoms are concussion related.

Reporting Behavior

Failing to diagnose or report a concussion may have both short- and long-term health consequences, such as prolonged recovery or a greater symptom burden.²³ Asken et al²³ observed that student-athletes who delayed removal from play averaged an additional 3 days until recovery compared with those who were removed from activity immediately. It is imperative that a concussion be reported and the athlete immediately removed from play. Participants in this study often described the short-term consequences of concussion reporting. Student-athletes should be told that their concussion recovery and symptom burden might be lessened if they report their injury sooner.

The causal or even correlated relationship between concussions and potential long-term health consequences is a high-interest topic in the recent research literature and sport community and was a subtheme in our study. A concussion history and depression have been linked in retired professional athletes^{24,25} and adolescents.²⁶ Authors²⁷ have also identified associations between multiple concussions and diagnosed mild cognitive impairment, self-reported memory impairments, and spouse- or relative-reported significant memory impairments. Our participants discussed perceived long-term consequences after concussion. Although some consequences are supported in the literature, the long-term implications after injury should continue to be examined longitudinally.

Other reasons student-athletes may fail to report concussion include not believing the injury is serious enough, not wanting to be removed from athletic participation, not wanting to let their teammates down, and being unaware that their symptoms indicate a concussion.^{1–3,7,8} These reasons aligned well with our results, suggesting that previous top-down techniques have captured these factors in a reasonably comprehensive manner. Educational efforts should continue to address

symptom recognition and reinforce the view that athletes want their teammates to perform at 100%, not 50%.

Support Systems

Consistent with the socioecological model,^{28,29} student-athlete support systems and the larger sport culture influenced decisions to report or conceal a concussion. Coaches influenced athletes in a number of ways, including, as our findings suggested, through their perceptions and beliefs regarding concussions. Kroshus et al³⁰ investigated correlations between coaches' attitudes, beliefs, and communications regarding concussions and athlete behavior. Coaches with more negative attitudes and beliefs regarding concussions were less likely to encourage concussion safety. Additionally, Chrisman et al³¹ found that negative messages from coaches influenced student-athletes' concussion reporting. These results, along with our findings, highlight the need for coach involvement and show how coaches can both positively and negatively influence athletes' experiences.

Our participants indicated that parents, teammates, athletic trainers, and some coaches generally supported concussion reporting and typically did not treat athletes negatively after an injury was reported. Contrary to our findings, Kroshus et al⁶ noted that student-athletes rated their teammates as exerting the greatest influence and perceived pressure to continue playing with a concussion, followed by coaches, parents, and then fans. These divergent outcomes may be related to site differences and the fact that we interviewed individuals who had sustained concussions versus surveying participants who were imagining what others would think. Regardless, these groups could benefit from education regarding the role they play in concussion reporting and recognition.

Respondents frequently discussed the role of athletic trainers in their concussion reporting. At a large university, ample access to health care providers, including athletic trainers, is available as at least 1 athletic trainer is assigned to each sport. This may not be the case at every institution. Therefore, student-athletes' access to athletic trainers should be considered when attempting to increase concussion reporting.

Limitations and Future Research

A limitation of our study was that the principal investigator was involved in concussion management for many participants (n = 11). To reduce any potential bias this might have introduced, we pursued many steps, including taking a team approach to data analysis, conducting member checks, and calling on external reviewers. Qualitative research does not aim to be generalizable, and these findings relate to only the participants in this study. Also important was that our sample was largely female. Future researchers should expand on these results by examining equal numbers of male and female participants from different geographic locations and should consider the length of recovery. Additionally, because our results highlighted that individuals often drew from their own concussion experiences, future authors should qualitatively explore reporting of sport-related concussion by individuals without a concussion history.

CONCLUSIONS

We discovered 3 main themes related to concussion reporting among collegiate student-athletes: concussion perceptions, reporting behavior, and support systems. Participants were able to accurately name common concussion signs and symptoms, often drawing from their own experiences with the injury. Both short- and long-term health consequences influenced whether they reported their concussions. Future research is needed to determine whether educational interventions are more effective if they use student-athletes' own words to describe a concussion and explore how to incorporate those in the student-athletes' support systems, especially among coaches and athletic trainers.

ACKNOWLEDGMENTS

We thank Tricia M. Kasamatsu, PhD, ATC, for serving as the external reviewer. Michelle L. Weber Rawlins, PhD, ATC, received stipend and travel funds from the National Collegiate Athletic Association–Department of Defense Research Grand Challenge: Changing Attitudes about Concussions in Young and Emerging Adults Grant. Julianne Schmidt, PhD, ATC, was the principal investigator on this grant and also received travel funds.

REFERENCES

1. Register-Mihalik J, Guskiewicz KM, McLeod TCV, Linnan LA, Mueller FO, Marshall SW. Knowledge, attitude, and concussion-reporting behaviors among high school athletes: a preliminary study. *J Athl Train*. 2013;48(5):645–653. doi: 10.4085/1062-6050-48.3.20
2. Llewellyn T, Burdette GT, Joyner AB, Buckley TA. Concussion reporting rates at the conclusion of an intercollegiate athletic career. *Clin J Sport Med*. 2014;24(1):76–79. doi: 10.1097/01.jsm.0000432853.77520.3d
3. Wallace J, Covassin T, Nogle S, Gould D, Kovan J. Knowledge of concussion and reporting behaviors in high school athletes with or without access to an athletic trainer. *J Athl Train*. 2017;52(3):228–235. doi: 10.4085/1062-6050-52.1.07
4. Terwilliger VK, Pratson L, Vaughan CG, Gioia GA. Additional post-concussion impact exposure may affect recovery in adolescent athletes. *J Neurotrauma*. 2016;33(8):761–765. doi: 10.1089/neu.2015.4082
5. Asken BM, Bauer RM, Guskiewicz KM, et al. Immediate removal from activity after sport-related concussion is associated with shorter clinical recovery and less severe symptoms in collegiate student-athletes. *Am J Sports Med*. 2018;46(6):1465–1474. doi: 10.1177/0363546518757984
6. Kroshus E, Garnett B, Hawrilenko M, Baugh CM, Calzo JP. Concussion under-reporting and pressure from coaches, teammates, fans, and parents. *Soc Sci Med*. 2015;134:66–75. doi: 10.1016/j.socscimed.2015.04.011
7. Kerr ZY, Register-Mihalik JK, Kroshus E, Baugh CM, Marshall SW. Motivations associated with nondisclosure of self-reported concussions in former collegiate athletes. *Am J Sports Med*. 2016;44(1):220–225. doi: 10.1177/0363545414512082
8. McCrea M, Hammeke T, Olsen G, Leo P, Guskiewicz K. Unreported concussion in high school football players: implications for prevention. *Clin J Sport Med*. 2004;14(1):13–17. doi: 10.1097.00042752-200401000-00003
9. Maxwell J. *Qualitative Research Design: An Interactive Approach*. 3rd ed. Thousand Oaks, CA: Sage Publications; 2013.
10. Suzuki LA, Ahluwalia MK, Arora AK, Mattis JS. The pond you fish in determines the fish you catch: exploring strategies for qualitative

- data collection. *Counsel Psychol.* 2007;35(2):295–327. doi: 10.1177/001100000629083
11. Anderson R. Intuitive inquiry: exploring the mirroring discourse of disease. In: Wertz FJ, Charmaz K, McMullen LM, Josselson R, Anderson R, McSpadden E. *Five Ways of Doing Qualitative Analysis: Phenomenological Psychology, Grounded Theory, Discourse Analysis, Narrative Research, and Intuitive Inquiry*. New York, NY: Guilford Press; 2011: 243–278.
 12. Wertz FJ, Charmaz K, McMullen LM, Josselson R, Anderson R, McSpadden E. *Five Ways of Doing Qualitative Analysis: Phenomenological Psychology, Grounded Theory, Discourse Analysis, Narrative Research, and Intuitive Inquiry*. New York, NY: The Guilford Press; 2011.
 13. Patton MQ. *Qualitative Research & Evaluation Methods: Integrating Theory and Practice*. 4th ed. Thousand Oaks, CA: Sage Publications; 2015.
 14. Creswell JW. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. Thousand Oaks, CA: Sage Publications; 2013.
 15. Lincoln YS, Guba EG. But is it rigorous? Trustworthiness and authenticity in naturalistic evaluation. *New Direct Program Eval.* 1986;30:73–84.
 16. Broglio S, Cantu RC, Gioia GA, et al. National Athletic Trainers' Association position statement: management of sport concussion. *J Athl Train.* 2014;49(2):245–265. doi: 10.4085/1062-6050-49.1.07
 17. Harmon K, Drezner J, Gammons M, et al. American Medical Society for Sports Medicine position statement: concussion in sport. *Br J Sports Med.* 2013;47(1):15–26. doi: 10.1136/bjsports-2012-091941
 18. McCrory P, Meeuwisse W, Dvorak J, et al. Consensus statement on concussion in sport—the 5th International Conference on Concussion in Sport held in Berlin, October 2016. *Br J Sports Med.* 2017;51(11):838–847. doi: 10.1136/bjsports-2017-097699.
 19. Concussion diagnosis and management best practices. National Collegiate Athletic Association. <http://www.ncaa.org/sport-science-institute/concussion-diagnosis-and-management-best-practices>. Accessed June 12, 2020.
 20. Schmidt JD, Weber Rawlins ML, Suggs DW Jr, et al. Improving concussion reporting across NCAA divisions using a theory-based, data-driven, multimedia concussion education intervention: a randomized control trial with one-year retention. *J Neurotrauma.* 2020;37(4):593–599. doi.org/10.1089/neu.2019.6637
 21. Lininger MR, Wayment HA, Huffman AH, Irving L. An exploratory study on concussion-reporting behaviors from collegiate student athletes' perspectives. *Athl Train Sports Health Care.* 2017;9(2):71–80. doi: 10.3928/19425864-20161116-01
 22. Valovich McLeod TC, Bay RC, Heil J, McVeigh SD. Identification of sport and recreational activity concussion history through the preparticipation screening and a symptom survey in young athletes. *Clin J Sport Med.* 2008;18(3):235–240. doi: 10.1097/JSM.0b013e3181705756
 23. Asken BM, Bauer RM, Guskiewicz KM, et al. Immediate removal from activity after sport-related concussion is associated with shorter clinical recovery and less severe symptoms in collegiate student-athletes. *Am J Sports Med.* 2018;46(6):1465–1474. doi: 10.1177/0363546518757984
 24. Guskiewicz K, Marshall SW, Bailes J, et al. Recurrent concussion and risk of depression in retired professional football players. *Med Sci Sports Exerc.* 2007;39(6):903–909. doi: 10.1249/mss.0b013e3180383da5
 25. Kerr ZY, Marshall SW, Harding HP Jr, Guskiewicz KM. Nine-year risk of depression diagnosis increases with increasing self-reported concussions in retired professional football players. *Am J Sports Med.* 2012;40(10):2206–2212. doi: 10.1177/0363546512456193
 26. Chrisman SPD, Richardson LP. Original article: Prevalence of diagnosed depression in adolescents with history of concussion. *J Adolesc Health.* 2014;54(5):582–586. doi: 10.1016/j.jadohealth.2013.10.006
 27. Guskiewicz K, Marshall SW, Bailes J, et al. Association between recurrent concussion and late-life cognitive impairment in retired professional football players. *Neurosurgery.* 2005;57(4):719–726. doi: 10.1093/neurosurgery/57.4.719
 28. Kerr ZY, Register-Mihalik JK, Marshall SW, Evenson KR, Mihalik JP, Guskiewicz KM. Disclosure and non-disclosure of concussion and concussion symptoms in athletes: review and application of the socio-ecological framework. *Brain Inj.* 2014;28(8):1009–1021. doi: 10.3109/02699052.2014.904049
 29. Bronfenbrenner U. *The Ecology of Human Development*. Cambridge, MA: Harvard University Press; 1979.
 30. Kroshus E, Baugh CM, Hawrilenko MJ, Daneshvar DH. Determinants of coach communication about concussion safety in US collegiate sport. *Ann Behav Med.* 2015;49(4):532–541. doi: 10.1007/s12160-014-9683-y
 31. Chrisman SP, Quitiquit C, Rivara FP. Qualitative study of barriers to concussive symptom reporting in high school athletics. *J Adolesc Health.* 2013;52(3):330–335.e333. doi: 10.1016/j.jadohealth.2012.10.271

Address correspondence to Michelle L. Weber Rawlins, PhD, ATC, Department of Interdisciplinary Health Sciences, A.T. Still University, 5850 East Still Circle, Mesa, AZ 85206. Address email to mweber@atsu.edu.