

Factors Influencing Concussion Reporting Intention in Adolescent Athletes

Natalie Cook and Tamerah N. Hunt

Clinical Scenario: Concussions are severely underreported, with only 47.3% of high school athletes reporting their concussion. The belief was that athletes who were better educated on the signs and symptoms and potential dangers of concussion would be more likely to report. However, literature has shown inconsistent evidence on the efficacy of concussion education, improving reporting behaviors. Factors such as an athlete's attitude, subjective norms, and perceived behavioral control have shown promise in predicting intention to report concussions in athletes. **Focused Clinical Question:** Do attitudes, subjective norms, and perceived behavioral control influence adolescent athletes' intention to report? **Summary of Key Findings:** Three studies (1 randomized control and 2 cross-sectional surveys) were included. Across the 3 studies, attitudes, subjective norms, and perceived behavioral control positively influenced athletes' reporting intention. The studies found that attitude toward concussion reporting and perceived behavioral control were the most influential predictors of reporting intention. **Clinical Bottom Line:** There is moderate evidence to suggest that positive attitudes, supportive subjective norms, and increased perceived behavioral control influence reporting intention in secondary school athletes. **Strength of Recommendation:** Grade B evidence exists that positive attitudes, supportive subjective norms, and increased perceived behavioral control positively influence concussion reporting intention in secondary school athletes.

Keywords: young adult, reporting behaviors, mild traumatic brain injury

Clinical Scenario

Concussion has been deemed an epidemic by the Centers for Disease Control with potential costly medical care and long-term consequences. Due to potential risks associated with not reporting a concussion, legislation involving adolescents and concussion has been passed in all 50 states and in the District of Columbia.¹ Education has been called the "cornerstone of concussion prevention," and thus, a key component of state legislation was requiring student-athletes to be educated on concussions.¹

Concussion education has focused on increasing knowledge of common mechanisms, signs and symptoms, management, and so on. The literature has consistently found an increase in concussion knowledge following an educational intervention; however, incidence rates have not changed with 1.6 to 3.8 million sports-related concussions occurring annually.² Unfortunately, concussions are severely underreported, with only 47.3% of high school athletes reporting their concussion.³ McCrea et al³ identified several reasons why athletes did not report a potential concussion as follows: the athletes did not think it was serious, did not understand the severity, did not want to let teammates down, and finally, they did not want to leave the game.

The belief was that athletes who were better educated on the signs and symptoms and potential dangers of concussion would be more likely to report.¹ However, literature has shown inconsistent evidence on the efficacy of concussion education improving reporting behaviors.² It appears that educating athletes may decrease their willingness to report a concussion.² Further, recent research has taken into account other personal and socially

motivated reasons, beyond concussion knowledge, why athletes may not report.⁴⁻⁶ Overall, there is evidence that concussion knowledge may not be as good a predictor of intention to report concussions.^{7,8}

Recent evidence has suggested that increasing concussion knowledge alone does not increase an athlete's intention to report. Several theories have been suggested to examine strategies to increase reporting behavior. One theory is the theory of planned behavior that postulates a person's intention will be a good predictor of their actual behavior.⁹ Intention captures the motivational factors that influence behavior and indicate the willingness or effort a person will put forth to complete that behavior.⁹ Furthermore, the theory of planned behavior also considers personal and social influences on a person's behavior.⁹ According to the theory of planned behavior, a person's intention to perform a behavior can be predicted from the person's attitude, subjective norms, and perceived behavioral control.

Attitude, subjective norms, and perceived behavioral control have shown promise in predicting intention to report concussions in athletes.^{4-6,8} Attitude is the individual's belief about the consequences of performing a behavior.⁹ Athletes may believe reporting a concussion is in their best interest because of their health or they may not want to report because they worry about being removed from the game. Subjective norms are the perceived pressures to either perform or not perform a behavior.⁹ An athlete may have influences like a coach or parent who encourages them to report injuries. Alternatively, an athlete could worry that reporting a concussion will make their coach mad or their teammates will be disappointed. Perceived behavioral control relates to the perceived ease or difficulty to perform a task.⁹ Athletes who feel they have an easier time in reporting a concussion would likely have higher intention than someone who perceives it would be difficult to report a concussion. Athletes with daily access to medical professionals may feel more capable in their ability to report a concussion

Cook is with Georgia Southern University, Statesboro, GA, USA. Hunt is with the Department of Health Sciences and Kinesiology, Georgia Southern University, Statesboro, GA, USA. Hunt (thunt@georgiasouthern.edu) is corresponding author.

compared with an athlete who does not. Identifying factors that influence concussion reporting intention could lead to more effective educational interventions. Traditional models of behavior predict behavior using multiple personal and social factors.⁹ Therefore, it may be beneficial to use multifaceted concussion education that targets other factors in addition to concussion knowledge to improve athletes' reporting behavior.

Focused Clinical Question

Do attitudes, subjective norms, and perceived behavioral control influence adolescent athletes' intention to report?

Summary of Search, "Best Evidence" Appraised, and Key Findings

- The literature was searched for articles investigating the effect of attitudes, subjective norms, and perceived behavioral control on concussion reporting intention in adolescent athletes.
- The search yielded 5 studies (1 randomized control and 4 cross-sectional surveys), 3 of which met the inclusion criteria and were included for analysis.⁴⁻⁶ Two studies^{7,8} were excluded because they assessed participants outside of the target population (primarily collegiate athletes).
- Two studies^{5,6} found that attitudes, subjective norms, and perceived behavioral control were significant and explained between 45% and 71% of the variance in athlete's reporting intention.
- Two studies^{4,6} found that attitude toward concussion reporting and perceived behavioral control were the 2 most influential predictors of reporting intention.
- One study⁴ found that after an educational intervention, intention and perceived behavioral control were increased immediately post, and intention was still increased after 3 months.
- One study⁵ found that higher intention was associated with a decreased prevalence of playing with concussion signs and symptoms.

Clinical Bottom Line

There is moderate evidence to suggest that attitudes, subjective norms, and perceived behavioral control influence reporting intention in secondary school athletes.⁴⁻⁶ Attitude and perceived behavioral control were found to be most influential across all 3 studies.⁴⁻⁶ Athletes with more positive attitudes about concussions intend to report concussions more than those with less positive attitudes. When an athlete feels capable of reporting a concussion (perceived behavioral control), their intention is also increased.^{4,6} An educational program that targeted these factors showed increased intention in athletes at 3 months.⁴ However, perceived behavioral control was the only factor that was significant immediately after the intervention. More research is needed to understand how to target these factors. Clinicians should remember multiple factors that influence athletes' decision to report. Concussion education should continue to improve basic concussion knowledge while also supporting positive attitudes toward concussion, creating a supportive social environment, and empowering athletes to report concussions. Clinicians should address athletes concerns about concussion reporting, establish trust with athletes, and educate athletes on who and how they can report concussive injuries.

Strength of Recommendation

Grade B evidence exists that positive attitudes, supportive subjective norms, and increased perceived behavioral control positively influence concussion reporting intention in secondary school athletes. All factors were found to influence intention to varying degrees across all 3 studies with high-level evidence. Two studies were cross-sectional in nature, and the third study was a randomized control trial.

Search Strategy

Terms Used to Guide Search Strategy

- **P**atient/Client Group: secondary school or adolescent athletes (12–18 y)
- **E**xposure: attitude, subjective norms, and perceived behavioral control
- **C**omparison: N/A
- **O**utcome: intention to report concussions

Sources of Evidence Searched

- PubMed
- Google Scholar
- Hand Search

Inclusion and Exclusion Criteria

Inclusion Criteria

- Level 3 evidence or higher
- Investigated effects of attitude, subjective norms, perceived behavioral control, and reporting intention in adolescent athletes
- Limited to the English language
- Limited to the past 10 years (2009–2019)

Exclusion Criteria

- Studies including athletes not eligible to compete in secondary school
- Studies that examined other outcomes like incidence rate or gender

Results of Search

Three relevant studies⁴⁻⁶ were located and categorized as shown in Table 1.¹⁰

Best Evidence

The following studies in Table 2 were identified as the "best" evidence and selected for inclusion in the critically appraised topic (CAT). Reasons for selecting these studies were as follows:

- All 3 studies were level 3 evidence or above and published within the last 10 years.
- All 3 studies evaluate attitude, subjective norms, and perceived behavioral control on intention in adolescent athletes.

Table 1 Summary of Study Designs of Articles Retrieved

Level of evidence	Study design/methodology of articles retrieved	Number located	Author (year)
1	Randomized control	1	Sullivan et al (2018) ⁴
3	Cross-sectional survey	2	Beakey et al (2016) ⁶ Register-Mihalik et al (2013) ⁵

Table 2 Characteristics of Included Studies⁴⁻⁶ (Summary of Best Evidence)

	Beakey et al ⁶	Register-Mihalik et al ⁵	Sullivan et al ⁴
Study design	Cross-sectional survey	Cross-sectional survey	Randomized control trial
Participants	866 high school male rugby players (12–18 y) Participants were allocated into one of the 3 groups based on the school they attended. Groups 1 (n = 185) and 2 (n = 332) were private secondary schools, while group 3 (n = 349) was a public secondary school in a rural area.	167 high school varsity athletes (13–19 y; 98 males and 64 females) completed a questionnaire. 13 high schools had access to an athletic trainer, whereas the other 12 did not.	428 high school athletes from 5/35 high schools (12–18 y) Athletes were randomly assigned to either intervention (n = 229) or control group (n = 199). There was a high attrition rate and only 59 and 153 athletes from the intervention and control group, respectively, completed all time points
Intervention investigated	Participants completed a questionnaire about previous education, concussion knowledge, intention, and academic year. Additional questions addressed attitude, subjective norms, and perceived behavioral control.	Participants completed a questionnaire about symptoms reporting and intention. Additional questions addressed attitude, subjective norms, and perceived behavioral control at home and then mailed the finished document to the researchers.	Participants completed a questionnaire about knowledge, attitudes toward concussion reporting, subjective reporting norms, perceived behavioral control, and reporting intention. Prior to, immediately following, and approximately 3 mo later. The intervention consisted of multiple delivery methods (PowerPoint, videos, interactive demonstration, and discussion). The presentation lasted 1 h and covered many topics of concussion including (1) nature of concussion, (2) signs and symptoms, (3) assessment of concussion, (4) management and return to play, (5) importance of reporting, and (6) risks of continued play and short- and long-term health consequences.
Outcome measure(s)	Intention, attitude, subjective norms, and perceived behavioral control	Intention, attitude, subjective norms, and perceived behavioral control	Knowledge, attitudes toward concussion reporting, subjective reporting norms, perceived behavioral control, and reporting intention
Main findings	Concussion knowledge was shown to have a negative association (groups 1 and 2) or no relationship (group 3) on participants' direct attitude. Academic year had a negative association with direct attitude in all 3 groups. Attitude, subjective norms, perceived behavioral control, concussion knowledge, and academic year explained 71%, 45.1%, and 58.9% of the variance in intention to report concussion in the respective schools. The 2 strongest predictors of intention were attitude and perceived behavioral control.	Attitude, subjective norms, and perceived behavioral control explained 58% of the variance in intention. Increased intention was associated with a decreased prevalence of playing with sign/symptoms of a concussion during a game or practice. The participant's attitude and positive influence from coaches and teammates were key factors associated with intention to report concussion symptoms.	Athletes in the intervention showed increased concussion knowledge, perceived behavioral control, and intention increased immediately postintervention compared with baseline. No significant differences were seen in attitudes or subjective norms. At 3 mo, athletes in the intervention group had higher reporting intentions and concussion knowledge compared with the control group and their own baseline. Perceived behavioral control, subjective norms, and attitudes did not reach significance at 3 mo.
Level of evidence	3	3	1
Validity score	N/A	N/A	N/A
Conclusion	Concussion knowledge may not be the most effective way to influence concussion reporting. Educational interventions should target athletes' attitudes, confidence, and resources to report.	Clinicians should target athletes' attitude about concussion and promote positive supportive social norms as these may promote concussion reporting in high school athletes.	Concussion education improved reporting intention immediately and 3 mo postintervention. Perceived behavioral control was more affected immediately after the current intervention.

Implications for Practice, Education, and Future Research

It is vital to improve concussion reporting, as research shows as many as half of all concussions go unreported, and self-report is the primary diagnostic tool.³ Researchers and clinicians encourage concussion education as a way to increase knowledge in hopes it will increase reporting. Legislation mandates young athletes to receive concussion education but does not outline the content or topics that should be included.¹ Research supports a large majority of athletes who did not report receiving concussion education.^{4,6} This finding is concerning as current legislation mandates student-athletes should receive some form of concussion education. Therefore, athletes are either not receiving the education or it is not making a lasting impression. Most concussion education focuses on teaching athletes about the signs and symptoms of concussion, yet concussion knowledge was not associated with reporting behavior.^{2,8}

A study in this review found that concussion knowledge had no effect on reporting intention in 1 school and a negative effect on intention in 2 schools.⁶ In collegiate athletes, it appears that knowledge scores do not affect reporting intention between groups above and below the mean concussion knowledge score.⁸ Further, collegiate athletes with a 1-point increase in intention had 1.63 times greater odds of reporting.⁷ Therefore, intention to report is significantly associated with actual reporting behavior.⁸ Athletes had higher intention to report concussions, compared with both their baseline scores and the scores of the athletes in the control group immediately after the educational intervention used by Sullivan et al.⁴ Athletes with higher concussion reporting intention were found to be less likely to play with signs and symptoms of a concussion.⁵ There is minimal evidence that targeting concussion knowledge alone may not be enough to improve reporting behavior. Therefore, a multifaceted approach should be used when educating athletes about concussions with emphasis on creating a positive attitude toward concussion, supportive subjective norms, and perceived behavioral control to improve reporting intention.

Attitude, subjective norms, and perceived behavioral control had varying degrees of influence on athletes' reporting intention.⁴⁻⁶ Register-Mihalik et al⁵ found that attitude, subjective norms, and perceived behavioral control were significantly associated with intention to report. Positive attitude toward concussion was found to have the greatest influence on intention.⁵ These findings were paralleled by Beakey et al.⁶ who also found all 3 factors to be significant. Their investigation into schools found within 2 of the schools, positive attitudes were most influential, while 1 school perceived behavioral control influenced intention most.⁶

Taking the results across all 3 studies, attitude and perceived behavioral control had the most influence on intention to report. Focus should be placed on creating positive attitudes in athletes and empowering athletes to report to enhance intention to report.⁴⁻⁶ Clinicians should address worries that the athletes may have about reporting concussion symptoms such as removal from a game or letting down teammates. Having concerns addressed could potentially lead to more positive attitudes about concussion reporting in athletes.

Interventions to empower reporting in athletes, educational interventions, and clinicians should highlight who and how an athlete can report concussion symptoms. Sullivan et al⁴ found that athletes had increased perceived behavioral control after an educational intervention, but this change was no longer significant at 3 months postintervention. It may be beneficial to educate athletes

throughout the season rather than 1 educational event at the beginning to remind athletes and help mitigate the loss of information. Furthermore, having medical staff readily available to athletes could increase perceived behavioral control. If an athlete does not feel they can easily report their concussion, their intention to report can decrease.^{5,6} In support of this, Wallace et al¹¹ found high schools with an athletic trainer on staff had higher rates of concussion reporting compared with schools without an athletic trainer. One possible reason for this increased reporting is that athletes have more perceived behavioral control, as they have an easier time reporting a concussion when medical staff is easily accessible.

The role of subjective norms on intention and reporting behavior is still unclear. Subjective norms were not as influential in the current studies reviewed as attitudes and perceived behavioral control. Past studies have shown that one reason for nonreporting was that the athletes did not want to let down their teammates or coaches.³ Only 5.1% of collegiate athletes agreed or strongly agreed with the statement "my teammates will think I made the right decision" when referencing concussion reporting.⁸ The educational intervention in this review failed to significantly improve attitudes or subjective norms, however, intention still increased.⁴ It is unclear whether the educational intervention did not effectively target these factors or if they were not influential. Regardless, clinicians should work to create a supportive environment, establish trust with their athletes, and normalize concussion reporting.

The studies evaluated in this CAT provide evidence that future educational interventions should not focus solely on improving concussion knowledge but should also aim to improve athletes' attitude toward concussion, by creating an environment that is supportive of concussion reporting and equip athletes with resources, so they are able to report. More research is needed to understand the degree to which these variables influence athletes' intention. Additionally, more research is needed to identify specific ways to target attitude, subjective norms, and perceived behavioral control. The studies in this review also highlighted that many athletes are either not being educated on concussions or are unaware of the education they have received. Clinicians should work with schools and places of employment to set procedures in place that define what concussion education athletes will receive and ensure these policies are followed. The education should be based on the best current evidence and aim to improve athletes' intention to report concussions.

Future research should include the application of these factors into concussion education programs. Education programs should target multiple reasons why athletes do not report concussions. Additional randomized controls are required to evaluate the effectiveness of concussion education and its influence on reporting. This CAT should be reviewed in 2 years to determine whether additional best-research evidence has been published that could aid in answering the focused clinical question.

Acknowledgment

This research was supported by the Centers for Disease Control (grant: CE17-002).

References

1. Baugh CM, Bourlas AP, Perry KI. Requiring athletes to acknowledge receipt of concussion-related information and responsibility to report symptoms: a study of the prevalence, variation, and possible

- improvements. *J Law Med Ethics*. 2014;42(2):297–313. doi:10.1111/jlme.12147
2. Mrazik M, Dennison CR, Brooks BL, Yeates KO, Babul S, Naidu D. A qualitative review of sports concussion education: prime time for evidence-based knowledge translation. *Br J Sports Med*. 2015; 49(24):1548–1553. PubMed ID: 26307498 doi:10.1136/bjsports-2015-094848
 3. McCrea M, Hammeke T, Olsen G, Leo P, Guskiewicz K. Unreported concussion in high school football players. *Clin J Sport Med*. 2004;14(1):13–17. PubMed ID: 14712161 doi:10.1097/00042752-200401000-00003
 4. Sullivan L, Pursell L, Molcho M. Evaluation of a theory-based concussion education program for secondary school student-athletes in Ireland. *Health Educ Res*. 2018;33(6):492–504. PubMed ID: 30346610 doi:10.1093/her/cyy034
 5. Register-Mihalik JK, Linnan LA, Marshall SW, Valovich McLeod TC, Mueller FO, Guskiewicz KM. Using theory to understand high school aged athletes' intentions to report sport-related concussion: implications for concussion education initiatives. *Brain Inj*. 2013; 27(7–8):878–886. doi:10.3109/02699052.2013.775508
 6. Beakey M, Tiernan S, Collins K. Why do adolescent rugby players under-report concussion? An examination into the variables that influence their behavioural intention to report across three samples. *Eur J Sports Med*. 2016;4(1):65–76.
 7. Kroshus E, Baugh CM, Daneshvar DH, Nowinski CJ, Cantu RC. Concussion reporting intention: a valuable metric for predicting reporting behavior and evaluating concussion education. *Clin J Sport Med*. 2015;25(3):243–247. PubMed ID: 25051193 doi:10.1097/JSM.0000000000000137
 8. Kroshus E, Baugh CM, Daneshvar DH, Viswanath K. Understanding concussion reporting using a model based on the theory of planned behavior. *J Adolesc Health*. 2014;54(3):269–274.e2. PubMed ID: 24560034 doi:10.1016/j.jadohealth.2013.11.011
 9. Ajzen I. The theory of planned behavior. *Organ Behav Hum Decis Process*. 1991;50:179–211. doi:10.1016/0749-5978(91)90020-T
 10. Phillips B, Ball C, Sackett DL, Badenoch D, Straus S, Haynes B, et al. Levels of evidence and grades of recommendation. *Centre for evidence-based medicine. Oxford-centre for evidence based medicine: GENERIC*. 1998.
 11. 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. PubMed ID: 28387561 doi:10.4085/1062-6050-52.1.07