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### Concussions in Collegiate Club Sports: Investigating Concussion Education, Knowledge, and Attitudes

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## Concussions in Collegiate Club Sports: Investigating Concussion Education, Knowledge and Attitudes

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### Abstract

Approximately 9 million college students participate in organized sports, with 460,000 college athletes participating at the collegiate level (e.g., NCAA, NAIA) and the remaining 8.5 million playing club and intramural teams. Nationally, an estimated 1.7 to 3 million sports-related concussions (SRCs) occur per year. Despite the overwhelming number of student-athletes participating in collegiate club sports, literature on SRC education, knowledge, and attitudes is limited when looking at collegiate club athletes. The purpose of this study is to explore current concussion education given to collegiate club sports athletes and understand players' concussion knowledge and attitudes. A cross-sectional study design using a modified version of Rosenbaum Concussion Knowledge and Attitudes Survey-Student Version (RoCKAS-ST) was emailed to all members within the 33 student-led club sport organizations at a Southeastern university. Seventy-one club athletes from 22 of the club sport organizations responded to the survey. Thirty-two participants (45.1%) reported that they have received at least one sports-related concussion and 39 (54.9%) reported never receiving a SRC. Fifty-five participants (77.5%) reported not receiving concussion education. Total knowledge was found to have significant differences between participants who received concussion education and participants who did not ( $t[69] = 1.135$ ;  $p = 0.048$ ). No significant differences were found in attitude between collegiate club sport athletes who received concussion education and players who did not receive concussion education ( $t[68] = 0.37$ ;  $p = 0.700$ ). The study indicated that a majority of collegiate club sport athletes do not receive concussion education, which impacts their knowledge of concussions. Further research is needed to determine effective concussion prevention education for this population.

**Keywords:** Concussion Knowledge, Club Sports, Sports-Related Concussions

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## INTRODUCTION

Over the last decade, sports-related concussion (SRC) research has greatly expanded due to the increased media attention that has shed light on consequences of traumatic brain injury (McKeithan et al., 2019). An estimated 1.7 to 3 million sports-related concussions occur per year in the United States (Daneshvar et al., 2011). There currently is an inconsistent presentation of concussions, which poses a tremendous challenge for health care professionals tasked with helping these injured athletes (Graham et al., 2014). The evaluation process relies heavily on sport participants to report suspected injuries along with any subsequent post-concussion symptoms (Baugh et al., 2019). To appropriately report a concussion, athletes must have foundational knowledge of the injury cause as well as the inclination to report their symptoms (Waltzman, 2020). Anderson et al. (2021) found that some collegiate student-athletes do not disclose concussions. Football has been found to have the highest prevalence of concussion nondisclosure, and there also are significant percentages of women's soccer (42%), men's lacrosse (36%), and wrestling (36%) collegiate student-athletes who also have reported previous concussion nondisclosure (Anderson et al., 2021). Additionally, club athletes are not given the same resources as varsity athletes. Club athletes may be at even higher risk of nondisclosure, as often they are not presented with the same resources that are available to varsity athletes (Beidler, 2018) and so may be less likely to report a concussion. Currently, there is very little research investigating the reporting behavior of collegiate club athletes. The purpose of this study is to explore current concussion education given to collegiate club sports athletes and understand players' concussion knowledge and attitudes. Specifically, this study strived to answer the following research questions: (a) Do collegiate club sport athletes receive concussion-related education? (b) Does receiving concussion education impact the degree of knowledge on sports-related concussions collegiate club sport athletes have? and (c) What are the attitudes and intentions of club sport athletes toward concussion reporting?

### **Collegiate Sports vs. Club Sports**

Current sports-related concussion (SRC) research primarily focuses on collegiate sports (Register-Mihalik, 2013; Baugh, 2015; Beidler et al., 2018) due to the number of national and state legislative initiatives (e.g., Centers for Disease Control and Prevention, HEADS UP, National Football League Concussion public-service announcements) that recently have been launched due to increased SRC awareness (Beidler et al., 2018). Evidence shows that approximately 9 million college students participate in organized sports, with 460,000 college athletes participating at the collegiate level (e.g., NCAA, NAIA) and the remaining 8.5 million playing club and intramural teams (Fuller et al., 2020). The National Intramural-Recreational Sports Association defines club sports as student-led groups “that are voluntarily organized to further their common interests in an activity through participation and competition” (Roberts, 2003). These organizations practice regularly, host games with other collegiate club programs and compete in national competitions (Lifschutz, 2012). Students who participate in collegiate club sports have been shown to develop life-enhancing skills such as coping with stress, maintaining/improving physical fitness, building friendships, and creating a sense of accomplishment (Forrester, 2006). These skills student-athletes develop are more likely to transfer into learned life and work characteristics, which creates higher odds of success for their future careers (Spreitzer, 1994). Despite the positive benefits of participating in collegiate club sports, the luxuries provided to varsity athletes typically are not provided for the club athletes (Pennington, 2008). Since universities often take a hands-off approach to managing club sports, students are named sport club officers and have the responsibility of coordinating practices and competitions, managing finances, and adhering to all regulations (Lower et al., 2013). The limited involvement by universities indicates that club sport athletes do not receive the same injury prevention education as varsity sports and that responsibility falls on sport club

officers. While the National Intramural-Recreational Sports Association (NIRSA) does not currently have an injury reporting system, a previous study by Arthur-Banning et al. (2018) found that club sports have a significantly higher rate of injury compared to previously-documented NCAA athletes. With a high injury rate and no national organization mandating specific concussion protocols or guidelines, there is a need to explore current practices in club sports concussion education and knowledge to understand the factors associated with SRC underreporting in club athletes (Musille, 2016). Additionally, literature on SRC education and knowledge (i.e., basic injury awareness, related signs and symptoms, potential health repercussions) is limited when looking at collegiate club athletes.

### **Concussion Education, Knowledge, & Attitudes**

A primary function of concussion education for athletes is to encourage honest and timely symptom disclosure to medical personnel (Kroshus et al., 2016). Promoting a culture that encourages athletes to report concussion-related symptoms (Robinson, 2021) as well as ensuring that players have the knowledge to identify if they are suffering from concussion-related symptoms (Register-Mihalik, 2013) is key in increasing concussion-reporting behavior. Attitudes about concussion reporting have been established in previous studies (Donnell et al., 2018; Garavito et al., 2020; Register-Mihalik et al., 2018). Common attitudes student-athletes hold included believing that their injury was not serious enough to report (McCrea, 2004), fearing letting down their teammates/coaches (Register-Mihalik, 2013), playing through the pain (Kaut et al., 2003), and feeling embarrassed to report an injury that is not observable (Rivara, 2013). Athletes' attitudes toward reporting concussions also has been found to be negatively affected by the lack of player knowledge regarding concussions (Pearce et al., 2017).

The National Collegiate Athletic Association (NCAA) implemented a policy in 2010 that requires institutions to provide varsity athletes with “informational materials about concussions” on an annual basis (Kroshus & Baugh, 2016). The guidelines outlined game-day management of concussion, including recognition of the injury (Baugh, 2015), permanent removal of the player with concussion from the game (White et al., 2014), and referral of the player to a medical doctor for assessment (Williams et al., 2012). These guidelines also outlined how concussions should be managed post-gameday, which included return-to-play guidelines that stipulate a player must have medical clearance before returning (Shenouda et al., 2012) and should do so using a gradual stepwise approach with a particular emphasis on remaining symptom-free (White et al., 2014). A previous study by O’Connell et. al (2016) found that there is a deficit in players’ concussion knowledge. When asked, almost 50% of athletes incorrectly stated facts about the treatment of concussion and 25% did not know if a player experiencing concussion-related symptoms during a game should continue playing (Cusimano, 2009). It has been well established that a lack of concussion knowledge negatively affects a player’s ability to seek proper treatment (Weber, 2012). Therefore, understanding the type of concussion education club athletes receive and the amount of knowledge club athletes have is important to furthering SRC research since collegiate club athletes are susceptible to the concussion-related problems that varsity collegiate athletes face, but are vastly under-studied.

### **Factors Associated with Underreporting**

Previous literature indicates that concussion education and knowledge are not the only factors that influence concussion-reporting behavior (Register-Mihalik, 2013). Intrinsic and extrinsic factors include pressure from teammates and coaches to continue playing despite a head injury, players not wanting to lose playing time, athletes in low contact sports feeling embarrassed by sustaining a concussion from their sport, and the belief that agreeing to play a sport also means agreeing to possibly withstand a concussion (Ernst & Kneavel, 2020). Other factors include whether players feel comfortable reporting their head injuries, athletes being

unaware they withstand a concussion, and not being in enough pain to report the injury (Davies & Bird, 2015). Health practitioners, coaches, and athletic trainers need to understand factors associated with underreporting to properly diagnose, treat, and allow players to return to play in order to reduce the risk of long-term effects of sport-related concussions. As there is a gap in literature on club sport athletes, there is a need to explore the factors associated in non-disclosure of sports-related concussions and symptoms in order to improve the care of these players. Therefore, the aim of this study is to understand the concussion education, knowledge, and attitude in collegiate club sport athletes.

## METHOD

The purpose of this study is to explore current concussion education given to collegiate club sport athletes and understand players' concussion knowledge and attitudes. This cross-sectional design utilized the Rosenbaum Concussion Knowledge and Attitudes Survey-Student Version (RoCKAS-ST) survey to collect data on the knowledge and attitudes of concussion on club sport athletes. The current study included men and women from the 33 student-led club sport organizations recognized by a medium-sized university. Of the 33 teams, there was a combination of male, female, and co-ed programs (male = 7, female = 8, co-ed = 18). Ethical approval was obtained from the Institutional Review Board at Clemson University.

### Participants and Instrumentation

Seventy-one club athletes from a medium-sized university in the Southeastern United States were recruited to participate in a survey on knowledge and attitudes of concussions during the Fall semester of 2021. Twenty-nine participants (40.8%) were male and 42 (59.2%) were female. Ages ranged from 18-23 years ( $M = 20.15$ ,  $SD = 1.36$ ). Years in college varied with 15 (21.1%) participants in their freshman year, 14 (19.7%) participants in their sophomore year, 18 (25.4%) participants in their junior year, 21 (29.6%) participants in their senior year and 3 (4.2%) participants being graduate students.

Of the 33 student-led club sport organizations, 22 club sport teams participated in taking the survey. The club sports included a range of high impact and low impact sports: baseball, men's basketball, men's ice hockey, men's lacrosse, men's volleyball, men's ultimate frisbee, men's rugby, men's soccer, women's basketball, women's field hockey, women's gymnastics, women's lacrosse, women's soccer, softball, women's volleyball, women's rugby, women's ultimate frisbee, swim, disc golf, fencing, and watersports (men = 8, women = 9, co-ed = 5).

The survey employed to measure knowledge and attitudes of concussions was a modified version of the RoCKAS-ST (Rosenbaum & Arnett, 2010). The RoCKAS-ST was selected because it is a comprehensive measure of assessing the constructs of interest. Internal consistency (Cronbach's alpha) has been conducted to test the validity of the RoCKAS-ST (Rosenbaum et al., 2010), which found "adequate" internal consistency (coefficient alpha = 0.76) and "satisfactory" test-retest reliability (Constantine et al., 2006).

The RoCKAS-ST consists of 55 items (Caron et al., 2018), from which the Concussion Knowledge Index (CKI) and Concussion Attitude Index (CAI) create scores for each participant. The CKI has a range from 0-25. Higher scores on the true or false questions within this section indicate higher concussion knowledge. In the original validation of the scale, the CKI demonstrated a test-retest reliability of  $r = 0.67$  (Rosenbaum & Arnett, 2010). The CAI has a range from 15-75, where higher scores indicate safer attitudes about concussions (Lystad et al., 2018). Using a 5-point Likert-type scale, participants rate who they feel about a concussion situation with 1 indicating they strongly disagree and 5 indicating they strongly agree (Deuschle et al., 2021). Higher scores indicate a higher concern for concussions. In the

original validation of the scale, the CAI demonstrated a test-retest reliability of  $r = 0.79$  (Rosenbaum & Arnett, 2010).

### **Procedure**

A survey was created on Questionpro, a data collection website, based on the RoCKAS-ST (Rosenbaum & Arnett, 2010). Once the survey was created, a link was generated and emailed to all active collegiate club sport student-athletes at the Southeastern university. All participants agreed to have their anonymous data used for research. Participants were given three weeks to complete the survey. Two follow-up emails were sent — one at the end of the first week and a second at the end of week two in an effort to improve the response rate. At the end week one, 85 total responses were collected, with 63 participants completing the full survey. At the end of week two, 101 total responses were collected, with 71 participants completing the full survey. The 30 participants who did not complete the full survey were excluded.

### **Data Analysis**

To evaluate whether concussion education impacts concussion knowledge, attitude, and intention to report a concussion, IBM SPSS Statistics software was used for analysis. Frequency distributions were used to evaluate the number of participants who have received at least one sports-related concussion, whether or not participants received concussion education and what type of concussion education participants received. Independent t-tests to compare those who have received concussion education to those who have not on the dependent variables of knowledge and attitude were employed.

## **FINDINGS**

A frequency distribution looked at participants' concussion history and concussion education. Thirty-two participants (45.1%) reported that they have received at least one sports-related concussion. Thirty-nine participants (54.9%) reported that they have not received a sports-related concussion.

To evaluate whether collegiate club sport athletes receive concussion education, another frequency distribution was employed. Fifty-five participants (77.5%) reported not receiving concussion education. This indicates that despite playing a high-impact or low-impact sport, collegiate club sport athletes often do not receive proper concussion education. Of the 16 (22.5%) participants who reported receiving concussion education, 10 (14.1%) took an online course, 4 (5.6%) received a 5–10-minute presentation on concussions, and 1 (1.4%) received a 10–30-minute presentation on concussions. One (1.4%) did not report how they received concussion education.

### **Concussion Education & Knowledge**

Independent t-tests comparing concussion education and total knowledge found significant differences between participants who received concussion education and participants who did not receive concussion education ( $t[69] = 1.135$ ;  $p = 0.048$ ). This indicates that collegiate club sport athletes who received concussion education had a higher level of knowledge than collegiate club sport athletes who did not receive concussion education. The significant effect for concussion knowledge would be characterized as a small effect size (Cohen's  $d = 0.32$ ; Cohen, 1992).

Cronbach's Alpha found internal consistency to be poor ( $\alpha = 0.24$ ). Based on the frequency distribution, participants' responses were not consistent. For some questions, all participants got the question correct, whereas most participants got the answer wrong on other

knowledge questions. This could indicate that the lack of concussion education collegiate club sport athletes receive impacts the level of knowledge athletes have on concussions, thus causing participants to answer concussion-related knowledge questions incorrectly.

**Concussion Education & Attitude**

Participants who received concussion education and those who did not receive concussion education were found not to have significant differences in total attitude through independent t-tests ( $t[68] = 0.37$ ;  $p = 0.700$ ). This indicates that the amount of education received by collegiate club sport athletes does not impact players' attitude toward concussion situations.

**Table 1**

*RoCKAS-ST CAI Cronbach's Alpha Item Statistics*

Item Statistics			
	Mean	Std. Deviation	N
Attitude 1	2.70	.953	70
Attitude 2	3.66	.508	70
Attitude 5	3.44	.651	70
Attitude 6	3.37	.641	70
Attitude 7	3.59	.648	70
Attitude 9	3.73	.536	70
Attitude 10	3.01	.860	70
Attitude 11	3.53	.531	70
Attitude 12	3.14	.767	70
Attitude 13	3.33	.775	70
Attitude 14	2.86	.856	70
Attitude 15	3.40	.623	70
Attitude 16	2.96	.788	70
Attitude 17	3.51	.583	70
Attitude 18	2.96	.711	70

Cronbach's Alpha found the CAI to have a high level of internal consistency ( $\alpha = 0.859$ ). This indicates that there is good item discrimination on the attitude scale. Table 1 provides the item statistics for the CAI section of the RoCKAS-ST survey. It was found that despite the amount of education received by collegiate club sport athletes, participants' attitudes toward concussion-related situations are relatively neutral.

**DISCUSSION AND RESULT**

The aim of this study is to understand the concussion education, knowledge, and attitude in collegiate club sport athletes. The main findings of this study were that 77.5% of collegiate club sport athletes reported not receiving concussion education, and there was a significant difference in concussion knowledge between participants who received concussion education and participants who did not receive concussion education. There is a limited amount of concussion-related research on collegiate club sport athletes. Furthermore, current research indicates that collegiate varsity student-athletes experience significantly more symptoms following a concussion compared with controls (Fedor et. al., 2015). Despite additional

recommendations for increasing concussion education (NCAA Sports Medicine Handbook, 2011), varsity athletes still fail to correctly identify sports-related concussions and concussion symptoms (McAllister-Deitrick et. al., 2022). Thus, exploring whether collegiate club sport athletes receive concussion education and the impacts this has on their concussion knowledge and attitudes is important in filling a current gap in concussion-related research.

As mentioned, one of the key findings of this study was that 77.5% of collegiate club sport athletes reported not receiving concussion education. Of the 22.5% of club sport athletes who reported receiving concussion education, there was no standard education given across the club sports. A study by Kroshus et.al (2014) found that there is no mandate on what type of material is delivered to players and how concussion education is delivered. Additionally, this study found that 45.1% of participants reported that they have received at least one sports-related concussion, despite players participating in a range of high-contact and low-contact sports. The extent to which athletes in high-contact sports receive concussion-related education may differ from athletes in low-contact sports (Hinton-Bayre et. al., 1999). Players in high-contact sports also may differ in attitudes toward sports-related concussions than athletes in low-contact sports due to their difference in exposure to concussions, which can impact intention to report (Weber et. al., 2019). Based on the prevalence of concussions in low-contact to high-contact sports, there is a need for future implementation of standardized education in collegiate club sports.

Another main finding in this study was that there were significant differences in concussion knowledge between participants who received concussion education and participants who did not receive concussion education. These results are similar to previous studies (Chinn et. al, 2016; Fedor et. al, 2015; Conway et. al., 2020) that found that higher levels of concussion-related education are significantly correlated with higher concussion knowledge. In an analysis by Kerr et. al. (2016) of 797 former collegiate athletes, 33% of players who received previous sports-related concussions reported that they failed to disclose at least one SRC during their entire high school, collegiate, and/or professional careers due to a lack of concussion-related knowledge. In order to appropriately report a sports-related concussion, collegiate athletes must have a foundational knowledge on concussions (Kerr et. al., 2016). The results from this study yielded significant differences in concussion knowledge between participants who received concussion education and those who did not, which may be explained due to the disparity in concussion education given to collegiate club sport athletes.

No significant differences were found in attitudes between collegiate club sport athletes who received concussion education and players who did not receive concussion education. Kroshus et. al. (2015) found that players' attitude is a good indicator in predicting if they would report a sports-related concussion. However, a study by van Vuuren et. al. (2020) indicates that sports-related concussions continue to be underreported because collegiate athletes prioritize being able to participate in their sport over their health. A variety of barriers impact a player's attitude, which impacts their likelihood to report a concussion (Salmon et. al., 2021). Some of these barriers include players believing concussions are an inherent part of the game, a player's passion/competitiveness, withholding information from trainers and coaches, being embarrassed by receiving a concussion in a low-impact sport, team culture, and not understanding that concussions can occur in any/all sports (Beverly et. al., 2018). Attitude not being statistically significant between collegiate club sport athletes who received concussion education and players who did not receive concussion education could be a result of the barriers each individual faces.



## Limitations and Implications

The sample size in this study was relatively small. This impacts the power of the study and could affect the internal and external validity. The study also only uses one university in the Southeastern United States, so the results from the study might not be generalizable to all collegiate club sport athletes.

This study indicated that there are significant differences in concussion knowledge between participants who received concussion education and participants who did not receive concussion education. Development of a standard concussion prevention education for collegiate club sport organizations is critical in improving athletes' knowledge and attitude toward concussions. Emphasis should be placed on the signs and symptoms of concussions, so players are aware of the effects of the injury. Additionally, schools permitting club and intramural sports should implement policies that guarantee players in club sports receive the same education as varsity sport athletes. With the NCAA implementing policies requiring that institutions provide varsity athletes with annual concussion education (Kroshus & Baugh, 2016), club sport athletes should receive a similar educational program. Despite the difference in competitiveness between varsity athletes and club sport athletes, they still are playing the same sports and facing similar risks of injury. Therefore, the development and implementation of a standardized concussion prevention education is important in increasing the knowledge, attitudes, and reporting behavior of collegiate club sport athletes.

## CONCLUSION

The purpose of this study is to explore current concussion education given to collegiate club sports athletes and understand players' concussion knowledge and attitudes. A key finding of this study was that 77.5% of collegiate club sport athletes reported not receiving concussion education. Additionally, this study identified significant differences in concussion knowledge between participants who received concussion education and participants who did not receive concussion education. No significant differences were found in attitude between collegiate club sport athletes who received concussion education and players who did not receive concussion education. These findings begin to fill the current gap in concussion-related research on collegiate club sport athletes; however, further research is needed to determine effective concussion-prevention education for this population.

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