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Time to Get in the Game: Opportunities for More Involvement in Sport-Related Concussion Management

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Summary

An estimated 1.6-3.8 million sport and recreation related concussions occur annually in the United States (Langlois et al., 2006). These figures vastly underestimate the true number of occurrences because nearly half of all sport-related concussions go unreported (Harmon et al., 2013; Llewellyn et al., 2014; Milroy et al., 2019; Register-Mihalik et al., 2013).

Many individuals who have a sport-related concussion experience changes in their cognitive-communication functions (Ackley & Brown 2020; Ketcham et al., 2017; Roth & Hardin, 2019). Speech-language pathologists (SLPs) are among the multidisciplinary professionals who provide services to individuals with sport-related concussions and perform research for improving concussion education (Brown & Knollman-Porter, 2019; Dachtyl & Morales, 2017; Knollman-Porter et al., 2018). For example, Knollman-Porter et al. (2018) investigated knowledge of concussion in college student athletes and nonathletes and found that both had incomplete knowledge of concussion definition, symptoms, and support services. In another study, Brown & Knollman-Porter (2019) investigated athletes' reporting intentions and post-concussion follow-up care and concluded that more information about athletes' reporting behaviors is needed to improve educational and clinical services.

Previous research has focused on identifying and describing 'demographic variables' associated with concussion reporting in collegiate athletes (e.g., athlete's age, sex, sport, history of concussion, etc.). Currently, no known study has examined the potential influence of post-concussion cognitive-communication impairments on concussion reporting. Understanding the barriers to concussion reporting and why athletes report or conceal their symptoms is crucial for developing efficacious prevention interventions and implementing long-term monitoring procedures post-concussion (Brown & Knollman-Porter, 2019; Kneavel et al., 2019). Well-

designed multidisciplinary educational and prevention initiatives can lead to increased reporting rates, thereby increasing athletes' access to speech-language pathology services (Knollman-Porter et al., 2018). To strengthen the role of SLPs in concussion management and prevention, research is needed that examines athletes' willingness to report a potential concussion based on changes to their cognitive-communication abilities.

Purpose

The purpose of the current study was two-fold. First, we sought to replicate the findings of previous studies that examined the influence of 'demographic variables' on concussion reporting in student-athletes. Second, we expanded upon previous research by examining whether changes in cognitive-communication functions influenced student athletes' intention to report. The specific research questions addressed in this study were as follows:

Demographic variables

- Are college athletes' intentions to report sport-related concussions 'for self' and 'for teammate' influenced by
 - (i) sex,
 - (ii) year in college,
 - (iii) type of sport played,
 - (iv) number of hours of sport-related concussion education received, and
 - (v) number of diagnosed sport-related concussion?

Cognitive-communication variables

- Are college athletes' intentions to report sport-related concussions 'for self' and 'for teammate' influenced by perceived changes in
 - (i) language functions (spoken language, auditory comprehension, and reading), and
 - (ii) cognitive functions (attention, memory, executive functions, visuospatial/constructional skills)?

Methods

A 54-item questionnaire was developed for the present study. The questionnaire consisted of three domains: (1) participant demographic profile (Items 1-16), (2) participants' intention-to-

report a sport-related concussion (Items 17-28), and (3) participants' likelihood of reporting a sport-related concussion if they experience a specific cognitive-communication deficit post-concussion (Items 29-54).

Items 17-28 were adapted from Kneavel et al. (2020). These items assessed student-athlete's intention to report for self (Items 17-22) and for a teammate (Items 23-28) using a 7-point Likert scale (1=Strongly Disagree, 7=Strongly Agree).

A review of the literature was performed to identify specific cognitive-communication impairments associated with sport-related concussion (Eisenberg et al., 2014; Knollman-Porter et al., 2018; McCrory et al., 2017; Roth & Hardin, 2019) and informed our development of questionnaire items 29-54. Participants responded to these items using the same 7-point Likert scale as described above.

Descriptive statistics summarized participant characteristics. All demographic variables and cognitive-communication responses were analyzed using a correlational matrix. ANOVAs were run to determine if statistically significant differences of sex, year in college, type of sport played, number of education hours received about sport-related concussion, number of diagnosed sport-related concussions, and cognitive-communication concerns differentiated student athletes who were more likely to report an injury from those who were less likely.

Results

A total of 193 student-athletes (130 female; 63 male) aged between 18-24 years from 3 universities/colleges in the Philadelphia area completed the questionnaire online. Athletes from 12 different sports were represented, including soccer (19.2%), lacrosse (17.1%), softball (15.5%), basketball (9.8%), field hockey (9.3%) and football (7.8%). Seventy-five participants (38.9%) reported having at least 1 diagnosed sport-related concussion, and 64 participants

(33.2%) believed they had at least 1 undiagnosed sport-related concussion. Participants demographic data is provided in table 1 below.

Table 1 Participant Demographic Data

Demographic Variables	Frequency	Percentage
Sex		
Male	63	32.6%
Female	130	67.4%
Sport		
Soccer	37	19.2%
Lacrosse	33	17.1%
Softball	30	15.5%
Basketball	19	9.8%
Field Hockey	18	9.3%
Football	15	7.8%
Other	41	21.3%
Diagnosis of at Least 1 SRC		
Yes	75	38.9%
No	118	61.1%
Felt they Had an Undiagnosed SRC		
Yes	64	33.3%
No	128	66.7%

Only 57 participants (29.5%) were classified as ‘likely reporters,’ indicating that a large majority of the student-athletes in the study might not report a sport-related head injury to a coach, athletic trainer, or medical professional.

The correlations between the intention-to-report total score and the participants’ demographic variables were not significant, e.g., sex ($r=.08, p=.274$), ethnicity ($r= -.118, p=.108$), age ($r= -.056, p=.447$), year in college ($r= -.037, 08, p=.611$), history of sport-related concussion ($r=.072, p=.323$), and number of hours of concussion education received yearly ($r= -.047, p=.576$). Table 2 illustrates these findings. However, statistically significant correlations were found for each of the cognitive-communication concern items and athletes’ intention to report a sport-related concussion for themselves and teammates who may experience those symptoms (see table 3).

Table 2 Pearson Correlations Based on Demographic Variables

Demographic Variables		Intention to Report
Sex	Pearson's r	.08
	p-value	.274
Ethnicity	Pearson's r	-.118
	p-value	.108
Age	Pearson's r	-.056
	p-value	.447
Year in College	Pearson's r	-.037
	p-value	.611
History of SRC	Pearson's r	.072
	p-value	.323
Number of hours of concussion education received yearly	Pearson's r	-.047
	p-value	.576

Table 3 Pearson Correlations Based on Cognitive Variables

Cognitive Variables		Intention to Report
Poor Concentration While Reading	Pearson's r	.423
	p-value	.000
Frequently Forgetting to Turn in Assignments for Class	Pearson's r	.398
	p-value	.000
Difficulty Thinking of the Right Word to Say in a Conversation	Pearson's r	.369
	p-value	.000
Difficulty with Telling a Story in the Correct Sequence	Pearson's r	.498
	p-value	.000
Difficulty Working on More Than One Task at a Time	Pearson's r	.440
	p-value	.000
Decreased Reading Speed	Pearson's r	.437
	p-value	.000

Conclusion

Learning about the necessity to report a sport-related concussion and doing so appear to be two different things. Student athletes need more knowledge about cognitive and communication deficits that can impact them. Students who rated possible word-finding difficulties, needing more time to complete assignments, forgetting things, and having trouble paying attention as more important were more likely to report themselves or a teammate after a sport-related head injury. This study has important clinical implications for increasing awareness and knowledge about the sequelae of sport-related concussion and the value of SLPs in concussion management and prevention.

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