
Examination of Teacher Knowledge, Dissemination Preferences, and Classroom Management of Student Concussions: Implications for Return-to-Learn Protocols

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Objectives. To determine teacher knowledge of (1) concussion symptomatology, (2) dissemination preferences, and (3) classroom management practices of student concussions. *Study Design.* A cross-sectional survey assessing concussion-related information was completed by teachers/instructors in the state of Alabama. *Results.* One-hundred and thirty participants completed the survey. Only a quarter perceived they were “very” or “extremely” confident enough to recognize signs related to a concussion (22.3%), and only 12.4% reported they were “very knowledgeable” about concussions. The majority were able to recognize more common concussion symptoms/challenges: headaches (95.4%), trouble concentrating (86.2%), memory (82.3%), balance problems/dizziness (82.3%), changes vision/hearing (76.2%), difficulty completing tasks (70.8%), difficulty making decisions (66.2%), changes in sleep (61.5%), and fatigue (60.8%); only half recognized emotional symptoms (e.g., mood) or symptoms associated with more prolonged recovery. Concussion informants were school nurses (74.4%), followed by parents (46.2%), students (46.2%), and coaches/athletic trainers (45.4%). A little under half of participants received concussion information as part of their job (41.9%). About 14.1% of teachers reported that someone had come to their school to talk with them as a group about concussions, and 82% felt they needed more information. Of the

37% who taught a concussed student, 83% reported they altered the classroom management strategies. *Conclusions.* In general, teachers were able to recognize the more commonly experienced concussion symptoms as well as management strategies. However, they appear to want greater concussion information and training. Given the daily influence of teachers on student tasks involving cognitive exertion, incorporation of formal concussion education for teachers is warranted.

Keywords: concussions; teachers; return-to-learn

A concussion is a traumatic brain injury that can affect one or several areas of cognitive functioning, such as processing speed, attention, memory, concentration, reaction time, and response accuracy (Dreer et al., 2008; Dreer, Marson, Krzywanski, DeVivo, & Novack, 2006; McGrath, 2010; Sim, Terryberry-Spohr,

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& Wilson, 2008). A concussion can also result in physical and emotional symptoms such as double vision, disruptions in sleep, balance problems, and changes in mood (Halstead et al., 2013; McGrath, 2010). Estimates from the Centers for Disease Control and Prevention suggest that the number of reported and unreported concussions among children and adolescents participating in recreational and sport-related activities is as high as 3.8 million injuries annually (McLeod, 2014). The duration of postconcussion symptoms is variable, with the majority resolving in approximately 7 to 10 days among elementary and early high school students (Corwin et al., 2014; Sim et al., 2008). However, among older adolescents, prolonged recovery can last up to 2 months (Brown et al., 2014; Majerske et al., 2008). While concussion research has focused predominantly on return-to-play decisions and the development of safety protocols, there is a dearth of studies examining return-to-learn (RTL) issues that have equally important implications on student academic performance, cognitive recovery, development, and quality of life.

RTL issues may include restricting activities involving cognitive exertion (e.g., computers, video games, texting, reading, studying, exams, homework assignments, and school attendance) and implementing environmental accommodations (e.g., extra time on quizzes/exams, having a note taker for classes while resting at home, studying in a quiet classroom or office; DeMatteo et al., 2015; Halstead et al., 2013; Master, Gioia, Leddy, & Grady, 2012). Currently, states, school districts, and teachers vary in terms of recommendations for cognitive rest (e.g., how much is needed and for how long), the types of accommodations to prescribe, and the amount of concussion management training. If symptoms persist, then more formal support services may be necessary (e.g., 504 plan, Individualized Education Plan). To our knowledge, only a small handful of states to date have passed legislation or best practice guidelines regarding RTL (e.g., Virginia, Nebraska, Hawaii, New York, Vermont, Maryland, Rhode Island, and Massachusetts). In general, many of these states require a written, progressive reentry plan for students postconcussion that includes input from the principal, teachers, licensed health care providers, and coaches. Additional states have Department of Education guidelines, rather than legislation, for concussion management of students returning to the classroom. As a general rule, these guidelines highlight the importance of multidisciplinary support, cognitive rest, and graduated academic accommodations. For example, in Colorado, concussion management guidelines are in place and supported by the Department of Education (McAvoy & Werther, 2014), along with the availability

of well-designed protocols that offer specific guidance on a more coordinated, systematic, and multidisciplinary team approach (McAvoy, 2014). Such materials highlight what each team member (family, school physical, school academic, medical) should be doing on a weekly basis postconcussion until the child is asymptomatic. Other informative materials/protocols are available to the public via the Centers for Disease Control and Prevention (2015a, 2015b) and Brain 101 (Glang et al., 2015).

The current status of the RTL literature consists predominantly of expert opinion papers for school and health professionals (Halstead et al., 2013; Master et al., 2012; McGrath, 2010; Piebes, Gourley, & Valovich McLeod, 2009; Popoli, Burns, Meehan, & Reisner, 2014; Sady, Vaughan, & Gioia, 2011; Weber, Welch, Parsons, & McLeod, 2015). Of the few empirical studies conducted to date, relationships have been found between lack of knowledge regarding concussion symptom recognition and management among school personnel (e.g., premature return to cognitive activities), worsening of student concussive symptoms, and greater risk for future concussions (Carson et al., 2014). Only until recently have concussion knowledge and RTL issues been studied among school professionals. However, such studies have been predominantly limited to high school principals' and school nurses' knowledge (Heyer, Weber, Rose, Perkins, & Schmittauer, 2014; Weber et al., 2015). An understanding of teacher concussion knowledge and management strategies is critical as teachers interact closely with children on a day-to-day basis. Specifically, they oversee and assign school-related tasks that require cognitive exertion and they communicate academic progress with parents. Furthermore, teachers have knowledge of the student's history of learning, social development, and other preexisting behavioral or medical problems that might affect academic progress (e.g., learning disorders, attention deficit disorder, depression, and developmental disorders).

Because cognitive symptoms postconcussion can negatively affect academic performance, teachers are in desperate need of guidance on the RTL process (McGrath, 2010; Sim et al., 2008). Currently, there is no consensus on statewide RTL protocols. Before recommendations can be formally adopted into policy, it is important to first understand teacher concussion knowledge, need, and preference for concussion training. Information on this topic will help identify areas for the development of health promotion practice protocols with teachers, policy intervention, and advocacy. Therefore, the objective of the current study was to conduct a brief needs assessment among teachers in order to determine teacher concussion (1) knowledge,

TABLE 1
General Demographic Characteristics of Teacher Participants (N = 130)

<i>Variables</i>	<i>n (%)</i>
Grade level taught	
Preschool	8 (6.2)
Kindergarten	4 (3.1)
Elementary school (Grades 1 to 8)	78 (60)
High school	23 (17.7)
Multiple grades (elementary and high school)	1 (0.8)
College	2 (1.5)
Provide classroom assistance/instruction	14 (10.8)
Average no. of students in classroom, <i>M/SD</i>	20 (20.44)
Average no. of years teaching, <i>M/SD</i>	11 (8.01)

(2) dissemination practices and preferences, and (3) classroom management strategies postconcussion.

► **METHOD**

Participants

A brief, cross-sectional survey of teachers and instructional aides was conducted. A total of 130 teachers completed the survey. The majority of the teachers taught elementary school ($n = 78$, 60%), followed by high school ($n = 23$, 17.7%), preschool ($n = 8$, 6.2%), kindergarten ($n = 4$, 3.1%), college ($n = 2$, 1.5%), or multiple grades ($n = 1$, .8%). Fourteen participants reported that they were classroom assistants/instructors ($n = 14$, 10.8%). The average number of years teaching was 11 years ($SD = 8.06$), and the average number of students per classroom was approximately 20 students ($SD = 9.51$; see Table 1).

Measure

The original intent of collecting the teacher concussion information was to ultimately improve statewide services for teachers working with concussed youth. Directors of the Alabama State Head Injury care coordinators designed a brief survey consisting of 30 questions to examine basic demographic information (3 questions), teacher recognition of concussion symptoms/behaviors (20 symptoms and behaviors), confidence in and knowledge about recognizing symptoms (2 questions), concussion dissemination information received (2 questions) and needed (1 question), and

classroom management practices (2 questions). The questions were based on a Likert-type scale, yes/no, and/or open-ended format. Questions were generated from discussions between State Head Injury Directors who had expertise in traumatic brain injury and youth rehabilitation services.

Procedures

Teachers from across counties in Alabama served by the Alabama Department of Rehabilitation Services met as a group in their respective school districts and were invited to anonymously complete the survey. Teachers were also given the option to complete the survey online. As the original intent of this effort was not planned for research but for improvements in service delivery, the current project consisted of a retrospective analysis of this previously collected data. No personal identifying information was linked to the surveys. The study design was descriptive and involved a convenience sample of teachers.

► **RESULTS**

The full range of survey questions, responses, and percentages from the surveys are reported in the Tables 2 to 4. A summary of key findings follows.

Teacher Knowledge of Concussions

Confidence in Recognizing Concussion Symptoms and Perceived Knowledge. A little under a quarter of the teachers perceived that they were “very confident” (17.7%) or “extremely confident” (4.6%) in their ability to recognize signs or symptoms related to a concussion (see Table 2). A similar pattern emerged for teachers’ perceived knowledge in understanding concussion-related symptoms with only 12.4% of teachers reporting that they were “very knowledgeable.”

Concussion Symptom and Behavior Recognition. When asked about concussion-related symptoms in a yes/no format, the majority of teachers/instructors were able to recognize some of the more common symptoms when cued: headaches (95.4%), trouble concentrating (86.2%), problems with memory (82.3%), problems with balance/dizziness (82.3%), sensory problems (sensitivity to light/noises) (76.2%), difficulty completing tasks (70.8%), problems with decision making (66.2%), changes in sleep (61.5%), and lack of energy/fatigue (60.8%). Interestingly, only about half of the teachers recognized other emotional symptoms commonly associated with concussions, such as changes in mood (52.3%), possible depression (39.2%), and/or irritability (56.2%). Other symptoms

TABLE 2
Teacher Concussion Knowledge (N = 130)

<i>Teacher Concussion Knowledge</i>	<i>n (%)</i>		
Confidence in recognizing concussion symptoms			
Extremely confident		6 (4.6)	
Very confident		23 (17.7)	
Neutral		38 (29.2)	
Somewhat confident		43 (33.1)	
Not at all confident		20 (15.4)	
Perceived knowledge in recognizing concussion symptoms			
Very knowledgeable		16 (12.3)	
Somewhat knowledgeable		63 (48.5)	
Neutral		13 (10.0)	
Somewhat unknowledgeable		12 (9.2)	
Not at all knowledgeable		25 (19.2)	
Missing data		1 (0.8)	
	<i>No</i>	<i>Yes</i>	
Teacher recognition of concussion-related symptoms			
• Headaches	6 (4.6)	124 (95.4)	
• Trouble concentrating	18 (13.8)	112 (86.2)	
• Memory	23 (17.7)	107 (82.3)	
• Problems with balance	23 (17.7)	107 (82.3)	
• Changes in sensory functioning (e.g., light sensitivity, noise sensitivity)	31 (23.8)	99 (76.2)	
• Changes in sleep	50 (38.5)	80 (61.5)	
• Lack of energy	51 (39.2)	79 (60.8)	
• Irritability	57 (43.8)	73 (56.2)	
• Changes in mood	62 (46.9)	68 (52.3)	
• Seizures	61 (46.9)	69 (53.1)	
• Lack of initiative	70 (53.8)	60 (46.2)	
• Depression	79 (60.8)	51 (39.2)	
• Impulsivity	85 (65.4)	45 (34.6)	
Teacher awareness of school-related behavioral changes postconcussion			
• Difficulty completing tasks	38 (29.2)	92 (70.8)	
• Difficulty with decision making	44 (33.8)	86 (66.2)	
• Difficulty with problem solving	54 (41.5)	76 (58.5)	
• Difficulty adjusting to daily activities	62 (47.7)	68 (52.3)	
• Difficulty returning to school/work	65 (50.0)	65 (50.0)	
• Inappropriate behavior	78 (60.0)	52 (40.0)	
• Social isolation	91 (70.0)	39 (30.0)	
	<i>Not sure</i>	<i>No</i>	<i>Yes</i>
Informant of concussion			
To your knowledge, do <i>coaches/athletic trainers</i> at your school inform teachers when a student has experienced a concussion? (1 case missing)	54 (41.5)	16 (12.4)	59 (45.4)

(continued)

TABLE 2 (CONTINUED)

	<i>Not sure</i>	<i>No</i>	<i>Yes</i>
To your knowledge, do <i>parents</i> at your school inform teachers when a student has experienced a concussion?	57 (43.8)	13 (10.0)	60 (46.2)
To your knowledge, do <i>school nurses</i> at your school inform teachers when a student has experienced a concussion? (1 case missing)	26 (20.2)	7 (5.4)	96 (74.4)
To your knowledge, do <i>students</i> at your school inform teachers when a student has experienced a concussion?	56 (43.1)	14 (10.8)	60 (46.2)

TABLE 3
Dissemination of Concussion Information Received/Needed by Teachers

<i>Concussion Information Received</i>	<i>No, n (%)</i>		<i>Yes, n (%)</i>
Have you ever received concussion information as part of your job? (1 case missing) If “yes,” what type(s) of format?	75 (58.1)		54 (41.9)
• Fact sheets/handouts/ brochures	16 (29.6)		38 (70.4)
• Online workshops/lectures/ seminars	26 (48.1)		28 (51.9)
• In-person workshops/lectures/ seminars	37 (68.5)		17 (31.5)
• Other (e.g., doctor report for specific students)	52 (96.3)		2 (3.7)
• Mobile apps	54 (100)		0 (0)
	<i>Not Sure, n (%)</i>	<i>No, n (%)</i>	<i>Yes, n (%)</i>
Has anyone come into your school to talk with you as a teacher/instructor as a group about concussions? (2 cases missing) If “yes,” who talked to you? (check all that apply)	23 (18.0)	87 (68.0)	18 (14.1)
• Nurse	0 (0)	8 (44.4)	10 (55.6)
• Coach/athletic trainer	0 (0)	13 (72.2)	5 (27.8)
• State department of education	0 (0)	14 (77.8)	4 (22.2)
• Children’s rehab services	0 (0)	15 (83.3)	3 (16.7)
• Other professional or organization (e.g., principal, rehabilitation counselor)	0 (0)	15 (83.3)	3 (16.7)

(continued)

TABLE 3 (CONTINUED)

	<i>Not Sure, n (%)</i>	<i>No, n (%)</i>	<i>Yes, n (%)</i>
• Physician	0 (0)	18 (100)	0 (0)
• Parents	0 (0)	18 (100)	0 (0)
• Neuropsychologist	0 (0)	18 (100)	0 (0)
• Think First Program (Children's of Alabama)	0 (0)	18 (100)	0 (0)
<i>Perceived Need for Concussion Information</i>		<i>No, n (%)</i>	<i>Yes, n (%)</i>
Do you feel you need more information about what to do if one of your students experiences a concussion? (2 cases missing): If "yes," what type(s) of preferred format? (check all that apply; 1 case missing)		23 (18.0)	105 (82.0)
• Fact sheets/handouts/brochures		45 (43.3)	59 (56.7)
• In-person workshops/lectures/seminars		57 (54.8)	47 (45.2)
• Online workshops/lectures/seminars		63 (60.6)	41 (39.4)
• Links to concussion resources		78 (60.0)	25 (25.0)
• Mobile apps		88 (84.6)	16 (15.4)
• Other concussion information		103 (99.0)	1 (1.0)

TABLE 4
Classroom Management of Concussed Students

<i>Questions</i>	<i>No, n (%)</i>	<i>Yes, n (%)</i>
To your knowledge, have you ever taught a student who experienced a concussion? (2 cases missing data) If "yes," who informed you? (check all that apply)	80 (62.5)	48 (37.5)
• Parent	20 (41.7)	28 (58.3)
• Coach	29 (62.5)	19 (39.6)
• Student	31 (64.6)	17 (35.4)
• Athletic trainer	33 (68.8)	15 (31.3)
• School nurse	36 (75.0)	12 (25.0)
• Physician	41 (85.4)	7 (14.6)
• Other teacher	46 (95.8)	2 (4.2)
• Self-observation	45 (93.8)	3 (6.3)
• Other (school counselor, other students)	45 (93.8)	3 (6.3)
• School psychologist	48 (100)	0 (0)
If "yes" to question above, did you do anything differently in terms of your classroom management? If "yes," who informed you? (check all that apply; 1 case missing)	8 (6.2)	40 (83.3)
• Provide extra time to work on class assignments	14 (35.0)	26 (65.0)
• Provide breaks for rest	17 (42.5)	23 (57.5)
• Reduce classroom assignments and homework	19 (47.5)	21 (52.5)
• Excuse students from physical activities	19 (47.5)	21 (52.5)
• Allow for extra time on tests/exams	22 (55.0)	18 (45.0)
• Reduce time spent on computer	24 (60.0)	16 (40.0)
• Allow extra time for going from class to class	30 (75.0)	10 (25.0)

(continued)

TABLE 4 (CONTINUED)

Questions	No, n (%)	Yes, n (%)
• Coordinate activities with other teachers	31 (77.5)	9 (22.5)
• Allow fewer hours at school	34 (85.0)	6 (15.0)
• Other modifications in management, specify	36 (87.8)	5 (12.2)
○ “Allowed student power naps to rest eyes/brain.”		
○ “He would get irritable when working with other children, so I was careful when pairing.”		
○ “Had student work in my computer lab and shut the door for a quiet area.”		
○ “He didn’t return to school immediately and was well when he did. If I had noticed any other behaviors, I would have addressed it in the ways listed above.”		
○ “I coach softball. I wouldn’t allow play until released from a doctor, and I introduced her slowly back in. She actually had another concussion a few weeks later, very scary.”		

and behaviors associated with more severe concussions were accurately recognized by teachers as occurring less frequently (e.g., impulsivity, inappropriate behavior, seizures, etc.).

Informant of Concussion Event. When teachers were asked about who they perceived informed teachers at their schools about the occurrence of possible student concussions, the majority reported school nurses informed teachers most often (74.4%) followed by students themselves (46.2%), parents (46.2%), or coaches/athletic trainers (45.4%; see Table 2).

Dissemination of Concussion Information and Education

Concussion Training/Education. Under half of the teachers reported receiving information on concussions as part of their job (41.9%; see Table 3). Of the teachers who received information, materials were largely in the form of fact sheets/brochures/handouts (70.4%).

Professionals Who Delivered Concussion Education. Only 14.1% reported that someone came into their schools and talked with them as a group about concussions. As seen from Table 3, school nurses were the most frequently reported professional (55.6%) to talk with teachers.

Need for Concussion Information. The majority of teachers reported that they needed more information about concussions and classroom management for students with concussions (82%). For those who indicated “yes” to needing more information, there was variability with a little over half preferring fact sheets/handouts/brochures (56.7%; see Table 3).

Classroom Management of Concussed Students

Taught a Concussed Student. Under half of the teachers reported that they taught a student who experienced a concussion (37.5%; see Table 4). Of those who indicated they taught a concussed student, the majority were informed primarily by parents (58.3%).

Classroom Management Modifications for Concussed Students. Of the teachers who reported they had taught a concussed student, a large majority reported modifying their classroom management practices for the concussed student (83.3%). When asked about specific modifications (see Table 4), the most common was providing extra time to work on class assignments (56.5%).

► DISCUSSION

The current findings provide insight regarding teacher concussion knowledge, dissemination preferences, and teacher classroom management approaches. Specifically, teachers were fairly knowledgeable about recognizing some of the more common concussion-related symptoms and behaviors. However, they did not appear to be as confident in their ability to recognize symptoms and behaviors, and only half of the teachers recognized emotional symptoms related to concussions. Surprisingly, only about half of the teacher respondents indicated that a concussion might cause difficulty returning to school. Of the teachers who reported having taught a child with a known concussion, the majority reported making classroom accommodations with variation in strategies employed. Under half of the teachers reported that they ever received concussion information as part of their job, with most information being fact sheets or handouts.

Given these findings, there appears to be opportunity for more comprehensive teacher concussion education efforts (e.g., personalized, interactive approaches). Teachers were interested in receiving concussion information and management strategies in a variety of formats. Thus, the findings lend support for greater teacher education, particularly with regard to the impact of a concussion on mental health, prolonged symptoms, and classroom management strategies. Existing programs such as Heads Up! Concussion in Youth Sports (Sawyer et al., 2010) or Brain 101 (Glang et al., 2015) have shown promise in the empirical literature with student athletes, parents, and school administrators and thus may be beneficial for teachers as well. Further research is needed to evaluate the feasibility and efficacy of such programs.

The findings also indicate the need for improvement in communication protocols and infrastructures between school, health care professionals, parents, and students regarding concussion notifications as well as symptom tracking, and management (Dettmer, Ettel, Glang, & McAvoy, 2014). As a whole, teachers perceived that school nurses were most likely to inform them of the occurrence of a concussion followed by parents, students, and coaches/athletic trainers. As momentum is shifting for the development of statewide concussion RTL protocols similar to that of legislation or best practice guidelines for return-to-play protocols, better coordination of care is warranted for RTL protocols. While this endeavor may be challenging, partnerships between medical and school systems, particularly teachers, may help maximize recovery (e.g., tracking of symptoms, consistency in management of symptoms, reporting of prolonged recovery; Arbogast et al., 2013; Gioia, 2014). Dedicating a half a day of training, continuing education credit courses, or a facilitated discussion prior to the school year would be beneficial for all involved. This would ensure a plan is in place following a suspected concussion addressing both return-to-play as well as RTL issues. Other options might include access to a secured, Web-based tracking system to more easily communicate concussion management issues among medical, family, and school personnel.

With various protocols and materials proposed in the literature and available to the public, further research is needed to evaluate the feasibility and efficacy of dissemination efforts among teachers, student age-groups, and school systems. Additionally, not all school districts may have access to certain resources. This knowledge will help inform potential advocacy and legislation efforts regarding a consensus of effective delivery systems and infrastructure for teacher/school concussion education protocols and statewide adoption into school systems (Dettmer et al., 2014).

Limitations and Directions for Future Projects

This initial investigation was intended to briefly assess general information related to student concussions among teachers to help improve services. Therefore, the information collected and tracking of data recruitment were limited (e.g., response rates and teacher counties in Alabama were not assessed). The survey format design may have overestimated respondents' knowledge due to the lack of distractors included among common to less common concussion symptoms/behaviors. Follow-up to this study using a more rigorous design, additional variables, and a larger sample size is warranted. We also did not attempt to survey other school personnel (e.g., school nurses who typically have more medical background). A more comprehensive assessment may help shed light on barriers and facilitators related to concussion education and management practices within school systems. This study was also cross-sectional in nature. Thus, examination of teacher practice patterns prospectively from the beginning and over the course of an academic year would be informative. Further studies designed to understand factors associated with successful, as well as unsuccessful, student academic performance postconcussion would be beneficial (e.g., number of previous concussions, history of learning disabilities, preconcussion academic performance, neurocognitive functioning, medications, days excused from academic studies/school, days excused from physical activities/sports, specific modifications at home and school, coordination of care, etc.). Last, we assessed teachers in Alabama, a state that does not have formal legislation or best practice policies for RTL. Differences in training may exist across states and should be explored. Our next step in our formative research is to work with our community-based participatory research team to develop a comprehensive RTL protocol for Alabama. We have used this approach successfully in our other research collaborations (Dreer et al., 2016; Dreer et al., 2013; Dreer, Weston, & Owsley, 2014).

Summary

As the scientific literature has focused predominantly on concussions and physical rest for return to play, less is known about cognitive and other environmental modifications for RTL decisions. These findings are important for teachers, parents, coaches, athletic trainers, school nurses, and allied health professionals working with parents and youth athletes. The information from this study illustrates the need for teacher education regarding student concussions, preferences in concussion education methods, and classroom management strategies. The more equipped teachers are in terms of RTL issues, the more likely postconcussion

recovery and academic performance are to be maximized.

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