



Original article

The Effectiveness of a Web-Based Resource in Improving Postconcussion Management in High Schools



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A B S T R A C T

Purpose: Because many sports concussions happen during school-sponsored sports events, most state concussion laws specifically hold schools accountable for coach training and effective concussion management practices. *Brain 101: The Concussion Playbook* is a Web-based intervention that includes training in sports concussion for each member of the school community, presents guidelines on creating a concussion management team, and includes strategies for supporting students in the classroom.

Methods: The group randomized controlled trial examined the efficacy of *Brain 101* in managing sports concussion. Participating high schools (N = 25) were randomly assigned to the *Brain 101* intervention or control. Fall athletes and their parents completed online training, and *Brain 101* school administrators were directed to create concussion management policy and procedures.

Results: Student athletes and parents at *Brain 101* schools significantly outperformed those at control schools on sports concussion knowledge, knowledge application, and behavioral intention to implement effective concussion management practices. Students who had concussions in *Brain 101* schools received more varied academic accommodations than students in control schools.

Conclusions: *Brain 101* can help schools create a comprehensive schoolwide concussion management program. It requires minimal expenditures and offers engaging and effective education for teachers, coaches, parents, and students.

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IMPLICATIONS AND CONTRIBUTION

Given the legislative mandates and increased school liability for child safety in the area of concussion, it is important to develop evidence-based cost-effective approaches to knowledge transfer and exchange in concussion management. Results from this randomized controlled trial suggest that the *Brain 101* intervention is one such approach.

Conflicts of Interest: The authors have no conflicts of interest to disclose. Information on clinical trials can be found at ClinicalTrials.gov (Identifier NCT01978795).

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Adolescent sports-related concussion accounts for nearly 15% of all reported injuries among high school athletes [1]. Most of those concussions happen during school-sponsored events. The high incidence of concussion has led to greater public awareness, changes in medical recommendations for evaluation and management [2], and concussion management laws in all 50 states. Most concussion laws mandate training for coaches, immediate removal from play when a concussion is suspected, and specific

requirements for when an athlete is allowed to return to activity [3,4].

Consensus has been established regarding field management of concussion and return to activity [5], and there have been a range of educational efforts in this area. One early resource was the Centers for Disease Control (CDC) “Heads Up” kit [6]. Initial data suggested that toolkit use was associated with gains in coach knowledge and awareness of concussion severity and increased efforts to minimize risks [7,8]. Similar increases in knowledge have been reported with education efforts targeting youth [9,10]. Over the past few years, several online education courses [6,11,12] have been developed and promoted to high school and youth sports coaches. Although education can increase knowledge regarding concussion, effective concussion management requires significant behavioral and cultural shifts among all school members: coaches, school and athletic administrators, educators, counselors, parents, and students. Schools need practical tools and guidelines to manage the academic aspects of concussion.

This article reports the findings of a randomized controlled trial of a schoolwide intervention, *Brain 101: The Concussion Playbook*. The Web-based program includes sports concussion training and resources for educators, coaches, students, and parents. The study’s hypotheses were

- (1) Use of the *Brain 101* Web site by athletes and parents will result in “increased knowledge” of concussion management compared with controls.
- (2) Use of the *Brain 101* Web site will result in increased athlete and parent behavioral intention to implement effective concussion management practices compared with controls.
- (3) Use of the *Brain 101* Web site will positively affect concussion management practices (i.e., seen by health care professional, returned to full activity, classroom accommodations provided).

Methods

Participants

Participating schools were recruited through the Oregon School Activities Association. Criteria for participation included (1) a registered athletic trainer (AT) on staff or contracted by school for services; (2) school access to a high-speed Internet connection, and (3) agreement to expose all students participating in Fall sports to the training. Because the study represented normal educational practices, it was deemed exempt by the ORCAS Institutional Review Board.

The Oregon concussion law, which went into effect in 2010, mandates annual coach education on concussion and specific guidelines regarding removal from play and safe return to activity [13]. Thus, coaches at all participating schools received concussion education and should have been aware that any athlete suspected of having a concussion must be removed from play until receiving medical clearance. Oregon law does not mandate concussion education for parents or students.

Sample size was determined based on Murray’s [14] discussion of power and assumed an intracluster correlation coefficient (ICC) between .05 and .15. Twenty-five schools participated in the study (13 intervention and 12 control). From participating schools, 4,804 Fall student athletes (2,264 intervention and 2,180

control) and 1,004 of their parents (445 intervention and 559 control) completed study instruments. A summary of demographic characteristics is provided in Table 1.

Instruments

Athlete survey. Athlete knowledge of sports concussion was measured using items from two validated instruments [15,16] and additional items derived from the *Brain 101* training program. The survey included eight true/false items (e.g., *you have to be hit on the head to have a concussion*) and identification of 18 correct or incorrect signs and symptoms of concussions (e.g., *sleep problems*). A composite knowledge score represented the proportion of correctly answered items and had an ICC of .089.

Knowledge application was assessed with six scenarios involving sports concussions (Appendix A). Each scenario was assessed with a five-point scale (1 = strongly disagree,

Table 1

Demographic characteristics for schools, Fall student athletes, and their parents

	Intervention (n = 13)		Control (n = 12)	
	Mean	SD	Mean	SD
School				
Size (n)	1,517.7	348.6	1,474.9	541.8
Free or reduced lunch	42.2	22.1	49.5	20.6
Hispanic	19.2	16.0	25.0	17.9
Race				
American-Indian/Alaskan Native	1.5	.7	1.3	1.07
Asian	4.9	4.8	5.8	5.2
Black or African-American	4.9	8.0	9.7	16.0
White or Caucasian	62.8	18.6	52.9	20.3
Multiracial	5.5	2.9	4.2	1.9
Fall Student Athletes				
Sex (female)	44.1	22.8	44.2	23.9
Grade				
9th/Freshman	32.7	19.7	26.6	13.6
10th/Sophomore	23.9	14.5	27.6	22.7
11th/Junior	20.1	11.7	22.6	12.2
12th/Senior	23.3	21.4	23.2	11.0
Hispanic	19.6	22.7	18.9	13.0
Race				
American-Indian/Alaskan Native	2.6	4.2	1.6	1.6
Asian	3.4	3.7	5.4	4.8
Native Hawaiian or Pacific Islander	4.1	11.2	1.9	1.8
Black or African-American	7.4	13.5	15.9	22.8
White or Caucasian	64.0	28.6	57.1	26.3
Multiracial	8.5	6.1	8.8	4.9
Other race	10.0	14.6	9.3	7.3
Parents of Fall Student Athletes				
Sex (female)	61.5	48.7	63.6	48.2
Hispanic	8.0	27.2	6.5	24.6
Race				
American-Indian/Alaskan Native	.7	8.4	1.3	11.3
Asian	2.1	14.5	5.2	22.2
Native Hawaiian or Pacific Islander	.5	6.9	1.9	13.5
Black or African-American	2.8	16.6	4.8	21.4
White or Caucasian	85.3	35.4	79.8	40.2
Multiracial	3.1	17.3	4.4	20.6
Other race	5.5	22.7	2.6	15.9

All descriptive summaries are aggregated to the school level, the level of randomization. Student summaries are based on 2,624 student athletes from intervention schools and 2,180 from control schools. Parent summaries are based on 445 parents of student athletes from intervention schools and 559 from control schools.

All data are mean percentages with the exception of school size. SD = standard deviation.

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