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High School Football players underreport head injuries: a descriptive comparative study.

by

Hillary Michael Nicole Oaks RN, BSN

Abstract

Introduction: Mild Traumatic Brain Injuries (MTBIs) are some of the most common injuries that occur in the adolescent athlete population, and yet experts believe that MTBI's are underreported. Most state athletic organizations require annual Pre-Participation Examinations in order to participate in high school sports. The purpose of this study was to research the effectiveness of the Ohio High School Athletic Association Pre-Participation Exam (OHSAA PPE) form in eliciting previous MTBIs.

Method: A descriptive, correlational study was conducted with 43 high school football players at a mass-screening event.

Results: There was a statistically significant underreporting of MTBI's on the OHSAA PPE exam compared to the Ohio State University Traumatic Brain Injury-short form questionnaire.

Discussion: Mild traumatic brain injuries, when left untreated, can become life altering and even life threatening. Proper recognition of MTBI in high school athletes is imperative in order to prevent long-lasting complications and injury.

INTRODUCTION

Mild Traumatic Brain Injuries (MTBIs) are some of the most common injuries that occur in the adolescent athlete population (Centers for Disease Control and Prevention, 2011). There are over 300,000 MTBIs documented in the U.S. per year. (AAFP, AAP, ACSM, AOSSM, AOASM, 2010) Many experts feel that this number may be drastically underestimated (Logan, Bell, & Leonard, 2001). Most state athletic organizations require annual Pre-Participation Examinations (PPE) in order to participate in youth or high school sports. (AAFP, AAP, ACSM, AOSSM, AOASM, 2010) The National Federation of High School Sports has worked diligently in past years to develop a PPE form that elicits helpful information about an athlete's medical history as well as their current health status. Even so, PPEs often contain incomplete information with a lack of self-reported information by the athlete or their parent/guardian. Mild Traumatic Brain Injuries, also referred to as concussions, are complex and can be hard to diagnose. Many athletes are unaware whether they have actually sustained a MTBI due to confusion of terminology (got "dinged", "bell rung"), improper diagnosis, or lack of follow-up after the injury.

Proper diagnosis of MTBI is imperative. Mild traumatic brain injuries, when left untreated, can become life altering and even life threatening. In 2002, researchers at the University of Pittsburgh Medical Center were the first to suggest that there is a cumulative effect of concussions in high school athletes. The conclusion was that for high school athletes with a pronounced history of concussions, there is a more severe on-field presentation of concussion markers (Collins, et al, 2002). Second Impact Syndrome is a syndrome, which occurs when a second brain injury is sustained before recovering from the initial concussion. It has been reported that second impact syndrome incidents result in death 50% of the time (Logan et al,

2001). High school-aged athletes recover more slowly from concussions than adults, or even college-aged athletes (CDC, 2011). Nearly 16% of football players who sustain a concussion severe enough to cause loss of consciousness return to play the same day, possibly indicating missed diagnosis or missed detection (CDC, 2011). With return to play these athlete's become at greater risk for complication and long lasting effects. Even when concussion symptoms disappear in as little as 15 minutes, 75% of those tested still demonstrate difficulties with memory and cognition 36 hours later (National Athletic Trainers Association, 2010).

An exhaustive search of Medline and CINHALL revealed a paucity of literature on the effectiveness of the PPE in identifying previous MTBI's among high school athletes. There were published papers that mention PPE issues dealing with common musculoskeletal problems (Von Fange, and Wirth, 2010), cardiovascular disorders (Reed, 2004), and asthma (Hong, & Mahamitra, 2005). However, no research was found with the current PPE form and concussion studies. Therefore, the purpose of this paper was to determine whether the current PPE form is able to reliably detect those students who have had an MTBI.

Pre Participation Examination

The PPE Pre-Participation Physical Evaluation monograph, which is in its fourth edition was compiled by a number of organizations including: American Academy of Family Physicians, American Academy of Pediatrics, American College of Sports Medicine, American Medical Society for Sports Medicine, American Orthopaedic Society for Sports Medicine, and American Osteopathic Academy of Sports Medicine (2010). This resource highlights the goals of a PPE form as having primary and secondary objectives. Primary objectives are to 1) screen for conditions that may be life threatening or disabling and 2) screen for conditions that may predispose to injury or illness (AAFP, AAP, ACSM, AOSSM, & AOASM, 2010). This book

provides a step-by-step guide to the “who, what, where, when” and identified the limitations in performing and executing PPE forms. The current questions pertaining to MTBIs on the 2013-14 OHSAA PPE are: 34. Have you ever had a head injury or concussion? And 35. Have you ever had a hit or blow to the head that caused confusion, prolonged headaches, or memory problems?

There are two common methods of administering the PPE; 1) individual screening of the athlete in the personal physician’s office and 2) mass screening in a group setting. (AAFP, AAP, ACSM, AOSSM, AOASM, 2010) Each method has its supporters and detractors. Supporters of the *individual screen* argue that the personal physician “knows” the athlete best, knows their personal medical history and has the athlete’s best interest at heart. Supporters of the *mass screenings* argue that specific experts are on hand to evaluate any potential problem that may be found during the screening. For the purpose of this research study, we chose to recruit athletes during a PPE mass screening.

Mild Traumatic Brain Injury

The Centers for Disease Control and Prevention defines a traumatic brain injury (TBI) as “something caused by a bump, blow or jolt to the head or a penetrating head injury that disrupts the normal function of the brain.” Not all blows or jolts to the head result in a TBI. The severity of a TBI may range from “mild,” i.e., a brief change in mental status or consciousness to “severe,” i.e., an extended period of unconsciousness or amnesia after the injury (CDC, 2013). The majority of TBIs that occur each year are concussions or other forms of mild TBI (CDC, 2013). No universally accepted definition of a concussion exists. However, in the National Athletic Trainers’ Association Position Statement on MTBIs, they define it as an injury that “involves an acceleration-deceleration mechanism in which a blow to the head or the head striking an object results in one or more of the following conditions: headache, nausea, vomiting,

dizziness, balance problems, feeling slowed down, fatigue, trouble sleeping, drowsiness, sensitivity to light or noise, LOC (loss of consciousness), blurred vision, difficulty remembering, or difficulty concentrating” (Guskiewicz, et al., 2004, pg. 9). The *hallmarks* of a concussion are headache, confusion and amnesia, although signs and symptoms vary with each individual. A study by Collins et al (1999) revealed that most sport-related concussions do not result in loss of consciousness; however, providers need to remember that loss of consciousness may be transient or missed (Sturmi, Smith, & Lombardo, 1998).

Pilot Study

A pilot study was conducted in 2012 at a high school in Southwest Ohio. Institutional Review Board (IRB) approval was obtained and all participants signed assents in addition to their parents providing consent for the study. Using the same methods as the current study, ten senior football players were recruited, and of those 10, six completed the study. These six athletes were asked three questions: 1) Have you ever hit your head during sports participation, recreational activity (biking, skateboarding, traveling in an automobile) or a fall; 2) Did you experience any symptoms after you hit your head; and 3) Did you seek medical care or did you tell someone that you hit your head? All six athletes answered “yes” to question #1 (have you hit your head), and all six athletes reported symptoms that were common with an MTBI diagnosis. Of these six, only three had sought medical care or told someone about their symptoms. Two of the six athletes reported their previous MTBIs on the OHSAA PPE form. The results of this pilot study supported the need for further study on a larger scale to determine the prevalence of underreporting MTBIs on the PPE.

METHODS

This was a descriptive, correlational study. In July 2013, licensed professionals completed pre-participation physicals at a local high school through a mass-screening event. After receiving Institutional Review Board (IRB) approval from both Cedarville University and the high school, the primary investigator (PI) recruited high school football players to participate in the study.

Sample

There were 68 athletes who were eligible to participate in the study. Inclusion criteria were: student athletes participating in high school football, able to read and write in English, a parent signature on the consent form along with a personally signed assent form. All laws pertaining to HIPAA and FERPA were followed in order to maintain athlete, school, and parental safety and privacy. Of those eligible, only 43 athletes returned their signed parental consent. See Table 1 for sample demographics for the 43 athletes who participated in the study.

Table 1: Demographics

Gender	Male: 100% Female: 0%
Age	15.5 (Range 14-19)
Comorbidities	Asthma 18.6% Hypertension 0.04% Lyme's Disease 0.02%

Measurement tools

A pre participation physical exam was defined as the approved OHSAA PPE form that was completed and signed by the appropriate health care provider during the mass screening. On the PPE form, the specific MTBI questions were: 34. Have you ever had a head injury or

concussion? And 35. Have you ever had a hit or blow to the head that caused confusion, prolonged headaches, or memory problems? The reliability and validity of the OHSAA PPE is not reported.

The Ohio State University Traumatic Brain Injury Identification Method- Short Form (OSU TBI-SF) is a 7-item questionnaire which elicits a structured interview to determine the lifetime history of TBI, while circumventing the draw back of self-reporting. The OSU TBI-SF avoids misunderstandings about what a TBI is. The OSU TBI-SF also provides further TBI history information, rather than “yes/no” answers. For example, the number of TBI’s, severity, effects, timing, and injury is information collected during the interview. The OSU TBI-SF has a high interrater reliability.

Data Collection:

Data collection was collected over several days. The PI described the study and handed out the consent and assent forms during initial contact with the subjects. On the day of the mass screening, the PI had a table at the site (high school gymnasium) where student athletes could stop, turn in their consents and assents, and complete the OSUTBI-SF. On the ensuing interview dates data was collected via the OSU TBI-SF. After reviewing the subject’s OHSAA PPE forms and history, the interview was conducted with this PI and a controlled environment. The interview questions were asked in succession, and following the instructions provided for the OSU TBI-SF in order to elicit TBI history.

Statistical Analysis

Data analysis was completed using SPSS version 20. Demographic data was calculated using means, standard deviations, and percent. The phi correlation was calculated with the MTBI data (nominal level).

RESULTS

Sixteen percent ($n = 14$) of the 43 screened athletes self-reported a previous MTBI on OHSAA PPE. In contrast almost 49% of the athletes ($n = 21$) reported one or more MTBI on the OSU TBI-SF ($p=.003$) (see Table 2).

Table 2: OHSAA TBIs reported in comparison to OSU TBI-SF TBIs reported

	PPE	OSUTBI	p
YES MTBI	7 (16%)	21 (49%)	0.003
NO MTBI	36	22	
n	43	43	

The OSUTBI-SF also allowed the athletes to report the number of MTBIs they had suffered in the past (see Table 3). Of the four athletes who reported two previous MTBI, two self-reported an MTBI on the PPE. Of the two athletes who reported three previous MTBI, one self-reported an MTBI on the PPE.

Table 3: Number of reported TBIs per OSU TBI-SF

OSU TBIs reported	Frequency	Percent
0	22	51.1
1	15	34.8
2	4	9.3
3	2	4.6

DISCUSSION

A annual national study has been conducted the last 10 years known as the: National High School Sport-Related Injury Surveillance System (RIO), which has objectives studied at specifically identified high schools in order to obtain a nationally representative sample. A wide variety of injury mechanisms have been studied and with data collected. For the past three consecutive years (2010-June, 2013) the number one high school injury in all high school sports is head concussions (Comstock, Collins & Currie, 2013). The southwest Ohio high school in which the data for this thesis has been collected is included within this RIO data.

In conjunction with the Children's National Medical Center the CDC has provided "Heads Up" facts and toolkits to facilitate proper diagnosis, symptom management and treatment for MTBIs (CDC, 2011). Within this tool kit there is a patient assessment tool called the Acute Concussion Evaluation or ACE. Gerard Gioia, PhD and Micky Collins, PhD developed this evaluation tool, in conjunction with the Children's National Medical Center. With the Latest Management Guidelines of Concussion in the Young Student-Athlete resource, the ACE tool is explained along with instructions on proper use of the evaluation tool including the latest recommendations. The ACE is intended to provide an evidence-based clinical protocol to conduct an initial evaluation and diagnosis of patients (both children and adults) with known or suspected MTBI (CDC, 2011). This tool kit also provides ACE Post-Concussion Home/School Instructions for the patient and families. This tool outlines things such as: when to seek care urgently, common signs & symptoms, returning to daily activities, do's and don'ts, returning to school, school personnel, returning to sports and recreation, stepwise return to activity/play, and follow up (CDC, 2011).

Only 42% of high schools in the U.S. have access to athletic training services and 47% of schools nationally fall short of the federally recommended nurse to student ratio (National Athletic Trainers Association, 2010). In response to the number of MTBIs in youth sports the Ohio Legislature passed House Bill 143. House Bill 143, passed April, 2013, defines youth sports organizations, defines youth coaching certification requirements, sets minimum guidelines for participation in athletics and youth sports, and mandates the Ohio Department of Health (ODH) to provide oversight to youth sports with respect to traumatic brain injury education. The ODH is required to create a concussion and head injury information sheet for interscholastic athletics and youth sports organizations that informs and educates coaches, parents, and athletes of the risks involved. This fact sheet is required to be updated annually with the most current information available. The ODH also is required to develop a free online training program for recognizing and evaluating concussions and head injuries for coaches and youth sports organizations and includes certification upon successful completion of said training.

This bill informs coaches, volunteer coaches, sporting officials, parents/guardians, school boards and other organizations to the significance of education and to the importance of abiding by the recommended guidelines for concussion prevention, treatment and awareness. Hopefully, this law will ensure the safety, prevention, and proper follow up care of these injuries to all youth involved in organized sports. This bill introduces new requirements for hundreds of coaches and thousands of players in youth sports sponsored by civic associations and booster groups (Bischoff, 2012).

IMPLICATIONS

The implications of this study suggests that the underreporting of TBIs per the OHSAA PPE warrants further research on the suspicion for other PPE underreporting. This suspicion includes cardiac disease, asthma, and eating disorders. What other organ damage or multi-system diseases are not being reported due to the under reporting?

The data of this study also suggests that further research must be conducted on the efficacy of mass screening events and PPE forms. Research must be conducted on the quality and accuracy of the data collected via the current PPE form process and questions.

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