

Mild Traumatic Brain Injury and Substance Use

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ABSTRACT

An evidence review of mild TBI (mTBI) sequela was undertaken to explore associations between mTBI and substance use in college students. The pilot study included a convenience sample of college students. The results did not support a statistically significant relationship between mTBI and substance use disorders (SUDs). These findings were contradictory from existing and emerging evidence; however, the magnitude of this relationship remains unclear and further supports the need for continued research.

Keywords: Mild TBI, Traumatic Brain Injury, Substance Use Disorders

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INTRODUCTION

A mild traumatic brain injury (mTBI) is defined as follows: brief mental status alteration, immediate memory loss before or after injury, and/or a less than 30-minute loss of consciousness and Glasgow Coma Scale score of 13–15 at 30-minutes postinjury.¹ mTBIs represent 70%–90% of all TBIs and are estimated to affect 42 million people worldwide.^{1,2} More than 40% of those who experience a mTBI and more than 60% of those who experience repetitive mTBIs do not seek medical attention.³ The purpose of this study was to review existing evidence, identify mTBI sequela, and administer a pilot study to identify whether there is a mTBI and substance use relationship among college students.

LITERATURE REVIEW

The following databases were searched: PubMed, PsychArticles, and Cochrane. The searches used the key terms *traumatic brain injury, mild traumatic brain injury, substance use, substance use disorders, and addiction*, with inclusive criteria of consistent dates between 2011 and 2016 and English language. Four articles were obtained: 1 systematic review, 1 secondary analysis, 1 prospective study, and 1 epidemiological case series. A second literature search was conducted using PubMed. The search used the key term *mild traumatic brain injury*, with inclusive criteria of consistent dates between 2012 and 2017,

English language, and systematic review. Seven articles were obtained: 5 systematic reviews, 1 meta-analysis, and 1 retrospective study.

mTBI Sequela

Systematic reviews have found soldiers returning from combat were more likely to have binged on alcohol in the previous month and were 2.3 times more likely to misuse alcohol; those who had experienced an mTBI were significantly more likely to experience mental health problems than soldiers without a mTBI history.^{4,5} A historical prospective study on military airmen who had experienced an mTBI found significantly increased opioid dependence or abuse within 179 days postinjury and alcohol dependence beyond 180 days of injury.⁶ Mental health disorder diagnoses are more common among those who have experienced an mTBI and have been found to be either a risk factor for or to contribute to a common pathology in the development of psychiatric illness.⁷ In the general population, suicide rates were 5 times higher in those who had experienced an mTBI with co-occurring substance abuse.¹ A meta-analysis conducted by Perry et al⁷ concluded that mTBI is an independent indicator for Alzheimer disease, Parkinson disease, mild cognitive impairment, depression, affective disorders, and bipolar disorder. Epidemiological studies have found mTBI to be associated with the development of

dementia and repetitive mTBIs linked to neurodegenerative diseases.²

Repetitive mTBIs, which can lead to chronic traumatic encephalopathy, is a progressive degenerative brain disease often seen in athletes and military personnel.^{8,9} A survey of 644 retired professional athletes found 52% used opioids during their career, with 71% reporting opioid misuse. One of the 3 strongest predictors of opioid use before retirement was undiagnosed concussions.¹⁰ Of those who misused opioids, 15% currently misused, a rate 3 times that of the general population. In addition, undiagnosed mTBIs (81%) singly predicted current opioid misuse versus opioid use as prescribed and increased the odds for consuming >14 alcohol drinks per week.¹⁰ However, a recent systematic review¹¹ found little to no evidence to support soccer-related functional and structural deficits from repetitive head trauma. Most general population studies focus solely on alcohol use or moderate to severe injuries without inclusion of mTBI. Current evidence supports some level of association between mTBI and substance use, but this remains conflicted.

METHOD

A midwestern university institutional review board approval was received to administer a case-control pilot study. Participants were drawn from a nonprobability sampling of college students. The study was conducted by an assistant professor and a senior-level nursing student. After the study was described to each participant, they were informed that they would be receive a \$5 gift certificate for their participation, that compensation was not contingent on study completion, and that withdrawal could occur at any time. Their consent for participation was then obtained. For study inclusion, participants must have been 18 years of age or older, English speaking, and a current college student. Instructions on questionnaire completion were explained by either researcher. Participants completed questionnaires and were provided clarification if requested.

The instruments used were the Psychoactive Drug History Questionnaire (PDHQ) and the Ohio State

University Traumatic Brain Injury Identification Method (OSU TBI-ID) questionnaire. The PDHQ collects data for 9 drug classes: alcohol, cannabis, stimulants (cocaine), stimulants (methamphetamine), amphetamines, benzodiazepines, sedatives, heroin, illicit methadone, other opioids, hallucinogens, inhalants, and other drugs. For each class, the following information was collected: drug used, years of use, was the drug injected, year of last use, and frequency of use per 6 months. The OSU TBI-ID asked 5 questions about head or neck injuries. Those who responded positively were asked to identify a loss of consciousness and at what age, repeated injuries, age(s) of occurrence, cause, and associated symptoms.

DATA ANALYSIS

Statistical analyses were conducted with SPSS Statistical Software. Descriptive statistics, and ranges for variables, frequencies, and percentages were used. Welch's *t*-tests were used. A 2-tailed *P* value < 0.05 was considered statistically significant.

RESULTS

Of the 50 participants, 27 were male and 23 were female. Ethnicity distribution was predominantly Caucasian ($n = 37$) and African American ($n = 11$) and between the ages of 18 and 25 ($n = 48$). Twenty-nine participants had at least 1 mTBI, 9 participants reported a second mTBI, and 4 participants reported having a third mTBI. About half of the participants reported both substance use and a history of mTBI ($n = 24$).

Homogeneity of variances was violated, as assessed by Levene's test for equality of variances ($P = .432$); therefore, separate variances and the Welch's *t*-test were used. An independent samples *t*-test was conducted to compare substance use after mTBI and substance use without mTBI. There was not a significant difference in the scores for the substance use after mTBI ($M = 1.68$; $SD = .474$) and without mTBI ($M = 1.43$; $SD = .535$) conditions; $t(7.75) = -1.14$, $P = .287$.

We hypothesized that participants who experienced mTBI loss of consciousness would have a higher frequency of substance use. These participants

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