Top Lang Disorders
Vol. 39, No. 3, pp. 276–292

The Risk for Traumatic Brain Injury and Persisting Symptomatology in Elementary, Secondary, and University-Level Students

An International Perspective With the Greek Version of the Brain Injury Screening Questionnaire

Andrea Makri, Aphroditi Koulenti, Kyriaki Argyrou, Wayne Gordon, and Fofi Constantinidou

Purpose: This study is part of the first systematic program in the Republic of Cyprus examining the prevalence of traumatic brain injury (TBI) in children, teenagers, and university students. The study incorporated the Greek Version of the Brain Injury Screening Questionnaire (BISQ-G) as the primary tool to identify students with TBI. **Methods:** The BISQ-G was sent out to 2,800 families of children (aged 6–18 years) attending rural and urban elementary and secondary schools from varied socioeconomic backgrounds. Nine hundred forty-four questionnaires (33.8%) were returned. In addition to school-aged children, 322 university students (aged 17–25 years) were recruited from 3 universities and completed the BISQ-G. **Results:** Analyses indicated that 5.8% elementary, 9.7% secondary, and 22.7% university students had symptoms consistent with TBI. Several participants reported more than 1 TBI. Etiology of TBI was similar in all 3 groups and included sports, biking, and falls. Factor analyses yielded a 7-factor structure for the BISQ-G.

Author Affiliations: *Department of Psychology, University of Cyprus, Nicosia, Cyprus (Mss Makri and Koulenti); Educational Psychology Service, Ministry of Education and Culture, Republic of Cyprus (Dr Argyrou); Icahn School of Medicine, Mount Sinai, New York (Dr Gordon); and Department of Psychology and Center for Applied Neuroscience, University of Cyprus, Nicosia, Cyprus (Dr Constantinidou).*

The authors express their gratitude to the study participants and their families, the schools that participated in the project, the teachers and school administrators who facilitated the data collection process, and the Cyprus Ministry of Education and Culture. In addition, the authors thank Militsa Demetriou, Militsa Ivanova, and Maria Makrygiorgi for their contribution in the data collection.

F.C. is senior author who conceptualized and designed the study, interpreted the data analyses, and revised the manuscript; A.M. is first author who conducted and interpreted the statistical analyses and drafted the initial manuscript; A.K. collected the secondary school data and assisted in initial manuscript preparation; K.A. translated the BISQ and collected the elementary school data; and W.G. is the creator of the BISQ, offered consultation, and revised the manuscript.

The authors have indicated that they have no financial and no nonfinancial relationships to disclose.

Corresponding Author: *Fofi Constantinidou, PhD, CCC-SLP, Department of Psychology, University of Cyprus, Kallipoleos 75, Nicosia 1678, Cyprus (fofic@ucy.ac.cy).*

DOI: 10.1097/TLD.0000000000000188

Discussion/Conclusions: The BISQ-G is a valid tool for the identification of individuals with a prior history of TBI. Causes and symptoms of TBI were similar to those reported in the international literature. The article concludes with suggestions for TBI management in the schools. **Key words:** *pediatric*, *prevalence*, *screening*, *symptoms*, *traumatic brain injury*, *young adults*

PEDIATRIC TRAUMATIC BRAIN INJURY—PREVALENCE

Traumatic brain injury (TBI) in childhood is considered to be a major cause of morbidity and mortality (Ichkova et al., 2017; Sariaslan, Sharp, D'Onofrio, Larsson, & Fazel, 2016), especially among those younger than 19 years (Allen, Chiu, Gerber, Ghajar, & Greenfield., 2014), leading to more than 100,000 hospitalizations each year. In particular, according to the Centers for Disease Control and Prevention (CDC) 2016 report, in 2013 TBI was the leading cause of more than 282,000 hospitalizations and 2.5 million emergency department visits. Approximately one to two million children and adolescents annually sustain brain injuries as a result of falls, assaults, sports, or motor vehicle accidents (Anderson, Catroppa, Haritou, Morse, & Rosenfeld, 2005; Taylor, Bell, Breidin, & Xu, 2017). In 1999, the US National Center for Health Statistics reported that TBI is the leading cause of death and disability in children between the ages of 1 and 14 years with a mortality rate of 10 per 10,000 annually. Approximately, 85% of children who sustain an injury are diagnosed with mild TBI and the remainder of the injuries are classified as moderate and severe brain injuries (Centers for Disease Control and Prevention, 2015).

IMPAIRMENTS FOLLOWING TBI IN CHILDHOOD

Health complications can arise soon after TBI, depending on the severity of the trauma, age of injury, the time since injury, and the general health of the patient (Lavoie et al., 2017; Prasad, Swank, & Ewing-Cobbs, 2017). According to the National Institute of Neurological Disorders and Stroke (2018), health consequences of TBI include seizures, hydrocephalus or posttraumatic ventricular enlargement, cerebrospinal fluid leaks, infections, vascular injuries, cranial injuries, cranial nerve injuries, pain, bedsores, multiple-organ system failure in unconscious patients, and complications resulting from polytrauma (trauma to other parts of the body in addition to the brain). There is, also, a strong relationship between severity of TBI and risk for epilepsy (Annegers & Pasternak Coan, 2000; DeGrauw, Thurman, Xu, Kancherla, & DeGrauw, 2018; Thurman et al., 2018).

In addition to health consequences, TBI may cause a wide range of changes in cognition (i.e., attention, concentration, memory), behavior (i.e., agitation, restlessness, fatigue,) sensation (i.e., vision or hearing deficits), and psychosocial functioning (i.e., depression, rage, withdrawal; Cancelliere et al., 2012; Cantor, Gordon, & Ashman, 2006; CDC, 2016; Gorman, Barnes, Swank, & Ewing-Cobbs, 2017; Lavoie et al., 2017; Mauri, Paletta, Colasanti, Miserocchi, & Altamura, 2014; Mychasiuk, Farran, & Esser, 2014; Rivara et al., 2011; Wade et al., 2011). These changes can last from several days to months postinjury in mild brain injury and be permanent in those whose injuries are more severe. These impairments can hamper psychosocial functioning, learning, and academic performance. Furthermore, a TBI during early childhood years can place children at risk for global reading disabilities and a deceleration in growth curves in intellectual abilities over time when compared with children injured at an older age (Catroppa et al., 2008; Karver et al., 2012).

Research on the long-term effects of pediatric TBI indicates that survivors of severe TBI demonstrate significant impairments in verbal learning and delayed retrieval of verbal information, visual memory, visual recognition memory, visual learning, sound–symbol learning, and recall of geometric designs

(Lowther & Mayfield, 2004). In addition, soon after the injury, these cognitive challenges emerge in school settings, including attention deficits, memory impairment, slowed processing speed, word-finding difficulties, impaired executive function, behavioral disinhibition, and emotional liability, which are a few of the aforementioned difficulties (Chesire, Buckley, Leach, Scott, & Scott, 2015). Although there are indications in the literature that some children with TBI have higher rates of premorbid attention deficits, there is substantial evidence that TBI is associated with the onset of new problems in attention in children (Wozniak et al., 2007).

According to Cantor et al. (2004), when cognitive impairments do occur after TBI, they are likely to persist, and those chronic deficits are found to be independent of the severity of the injury. The most enduring deficits are those of impaired attention (Pearn et al., 2017), concentration, judgment, and impulse control. In addition, according to Robinson et al. (2018), those who survive after pediatric brain injury are more likely to suffer chronic neurobehavioral deficits that can interfere with their personal or social life.

IDENTIFICATION OF CHILDREN WITH TBI

According to Prasad et al. (2017), children with complicated–mild/moderate TBI are at high risk for poor academic performance, and many fail or fall behind in school.

There are a number of reasons explaining the low rates of identification of children with TBI (Cantor et al., 2004). First, children may return to school after a head trauma that has not been recognized as TBI. This results in poor transition services between hospital and school, such as low referral rates for services, poor communication between the school and the medical system, and reliance on the family to report the brain injury to the school. In addition, due to the lack of awareness among educators and primary care providers of problems related to TBI (Cantor et al., 2004), outcomes are often misattributed to other etiologies. Teachers, in particular, find it difficult to link a child's problematic behavior to brain injury. They often mistakenly attribute the child's difficulties to either having learning disabilities or cognitive delays or psychosocial problems due to psychiatric versus neurological origin. In addition, schools provide inappropriate classroom accommodations and children with TBI have an increased risk for academic underachievement and psychosocial challenges (Savage, 1991; Ylvisaker et al., 2001). According to Haarbauer-Krupa et al. (2017), care for children with TBI in health care and educational systems is not well coordinated or integrated, resulting in increased risk for poor outcomes. What is more, in some school systems, children with TBI may never receive appropriate educational support. In particular, if the school is unaware of the TBI history, the child may not fall in a diagnostic category that would qualify for special education or other support services (Taylor et al., 2001; Verhaeghe, Defloor, & Grypdonck, 2005).

Second, the possible long-term effects of the injury may not always be fully understood by school personnel or adequately explained to the child's family. Therefore, the school's staff members may never become aware of the consequences of the injury or of the monitoring that they will need to do in relation to the child's performance. As a result, when a child with even a mild residual cognitive problem returns to the classroom, he or she may suddenly find it much more challenging to process and retain information, to sustain attention during class, to exhibit impulse control, and to make effective judgment decisions (Cantor et al., 2004).

Third, impairments secondary to TBI do not always emerge immediately. This lag is related to the continued development of the sensory systems and the frontal lobes not reaching maturity until the late teenage years. Although neuroplasticity may permit the development of alternative neural pathways, these might be less efficient and might compromise the original function of the compensating structure. As a result, a young child may appear to be developing normally for several years after TBI, but when presented with age-appropriate cognitive demands of the middle and high school years, the older child begins to experience significant cognitive and behavioral problems (Taylor et al., 2008; Toledo et al., 2012).

Chapman (2006) introduced the term "neurocognitive stall" to reflect the gradually evolving pattern of delay that follows a period of apparently typical development immediately subsequent to a child's initial injury. With neurocognitive stall, cognitive problems underlie learning difficulties that become evident only when a child fails to maintain academic achievement comparable with his or her typically developing peers. The delayed appearance of these learning challenges often masks the connection between an initial injury and later academic or social problems, particularly as these challenges often resemble those of students with learning disabilities or attention deficits. Although a child's TBI may go undiagnosed, educators may eventually note persisting cognitive effects in that child and become aware of altered patterns of achievement that have long-term academic reverberations (Cantor et al., 2004; Hux, Dymacek, & Childers, 2013).

The Individuals with Disability Education Act (1997), previously known as the Education for All Handicapped Children Act (U.S. Public Law 94-142), creates special education provisions for children and adolescents with TBI. The law points out the importance of offering opportunities to children with TBI for school adjustment and success. It also proposes that professionals should show sensitivity toward these children's special needs and that they should develop programs that demonstrate familiarity with the law that is specific to the education of these children. In contrast, the Special Education Act of the Cypriot legislation (113(I) 1999) does not make any references to the children with TBI. Instead, it concentrates on children with developmental or genetic disorders resulting in mental retardation and dyslexia.

SCREENING FOR PEDIATRIC TBI

As discussed in the previous section, the identification of children with TBI is resulting in underreporting and poor management (Anderson et al., 2005). Screening for TBI is an effective method for identifying the potential impairments following the brain injury and is the initial step toward improving the lives of children who may or may not have been diagnosed with TBI. A positive screening will help establish a probable basis for neuropsychological testing that may ultimately lead to an official, medical diagnosis and to the implementation of the appropriate interventions for recovery.

Screening instruments are extremely important because traumatic brain injuries are often overlooked or misdiagnosed. In addition, establishing a screening instrument will allow defining the percentage of the pediatric population with a probable TBI (Hux, Schneider, & Bennett, 2009; U.S. Department of Health and Human Services, 2006), as well as the identification of dual diagnosis (Sikka et al., 2017).

PURPOSE OF THE STUDY

Prior to this study, the percentage of students with TBI enrolled in Cyprus public schools was unknown. Cypriot children with TBI are part of a population group of children with special needs that is often overlooked and not investigated properly. Traumatic brain injury is not included as an etiology in the Cyprus special education database, which mostly focuses on children with other developmental and genetic disabilities.

The main purpose of the study was to investigate the prevalence of TBI in students across the developmental continuum in Cyprus. Furthermore, the translation and adaptation of the Brain Injury Screening Questionnaire (BISQ-G) in Greek were also carried out for the purposes of the study.

Cantor et al. (2006) examined BISQ's utility as a screening measure for TBI in children. They hypothesized that (a) the BISQ could be used to identify public school children with an increased probability of having sustained a TBI and (b) children identified by the BISQ as having an increased probability of having sustained a TBI would have more cognitive impairments and more behavioral and physical symptoms than those with a low probability of having sustained a TBI. They gathered data from a sample of 174 children aged 12–19 years recruited in three urban public schools. The BISQ was completed by the parent and the student and 48% of the sample completed a neuropsychological testing battery. Results indicated that 9% of the participants had a "high probability" of having sustained a TBI and more cognitive, behavioral, and physical symptoms were reported in the children in the "high-probability" group than in the "low-probability" group. Eighty percent of the "high-probability" children tested had neuropsychological evidence of cognitive impairment. The findings of the study supported the utility of the BISQ as part of a screening process to identify children who may have experienced a TBI. This study implemented the Greek version of the BISQ, the BISQ-G. We hypothesized that the BISQ-G would have adequate psychometric properties to identify individuals with a positive history of TBI. In addition, we hypothesized that the percentage of children, teenagers, and young adults with a positive screen for TBI, and the likelihood that the reported symptoms are TBI-related, will be similar to that of other western nations and estimated at 8%–10%. For the factorial validity of the Symptoms checklist of the BISQ, it was expected that responses to the items will be explained by three different factors. This hypothesis is based on the theory underlying the development of the BISQ, for the items contributing to three dimensions (Physical symptoms, Cognitive symptoms, and Behavioral symptoms), suggested by Gordon (2004).

METHODS

Participants

The sample of the study comprised a total number of 946 elementary school students, high school students, and university students.

Recruitment strategy and sample demographics

Boys and girls between the ages of 5 and 13 years, enrolled in public elementary schools, were recruited for this study from urban and rural public schools in the Nicosia, Larnaca, and Famacusta districts. Out of the 2,088 letters, consent forms and BISQ-G questionnaires that were sent to the parents, 706 or 33.81% agreed to participate and returned the completed questionnaires. Thus, data from 706 participants were included in this study and were used for the statistical analyses. A total sample of 500 participants was included in the factorial validity of the Part B of the BISQ-G.

A total of 574 or 81.3% were Greek Cypriot students and 4.1% ($N = 29$) were students from other national backgrounds, whereas information regarding the nationality of the 14.6% of the sample was missing. A total of 284 (40.2%) were male students and 319 (45.2%) were female students, whereas information regarding the remaining 14.6% of the sample was missing. The mean age of the elementary school students was 8.7 years ($M = 8.68$, $SD = 1.89$). The majority of the families (24.5%) reported an annual income of at least 35,000 euro, which is considered to be middle-class income. Information regarding the annual income of the 15.4% of the sample was not completed. Six hundred questionnaires (85%) were completed by a parent, five (0.7%) by a relative, and one (0.1%) by another person serving as a guardian (other than a parent or a family member). The relationship of the respondent to the child was not reported in 100 questionnaires.

A random sample of high school students enrolled in public and private secondary schools in the greater Nicosia, Larnaka, and Famagusta areas of Cyprus was recruited. Data from a total sample of 238 high school students were included in the study and were used for the statistical analyses. All high school students were Greek Cypriots, residing in the areas of Cyprus controlled by the Republic of Cyprus. One hundred twenty-one (50.8%) were male students and 117 (49.2%) were female students. The mean age of the high school students was 14.8 years ($M = 14.8$, $SD = 1.5$). As far as the factorial validity of the Part B of the BISQ-G, a total sample of 238 participants was included in the analysis.

The sample of 322 university students was recruited from undergraduate classes at three universities in Nicosia. Information regarding the study's aims and procedures was disseminated in classrooms. In-classroom assessments or individual appointments were then scheduled for the students who were interested in participating in the study. Two hundred twenty-six (70.2%) were male students and 96 (29.8%) were female students. The mean age of the university students was 20.6 years ($M = 20.64$, $SD = 1.8$). The majority of the students (14.2%) reported an annual income within the 15,000 euro range, which implies an average income as compared with the median family salary in the Republic of Cyprus. The majority of the sample (54%) did not report annual income. For the factorial validity of the Part B of the BISQ-G, a total sample of 186 participants was included in the analysis.

Procedures

The Ministry of Education and Culture, the Center for Educational Research and Evaluation, and the National Bioethics Committee, Republic of Cyprus, reviewed the protocol and approved the procedures for this study. The investigators obtained consent from all participants to secure their collaboration. A cover letter, providing information about the study, accompanied with the BISQ-G questionnaire and a consent form was mailed to parents of elementary and high school students, informing them of the aims and procedures of the study and requesting their voluntary participation in the project. The university students were also provided with a cover letter, providing information about the study, accompanied with a consent form and the BISQ-G questionnaire at the time of questionnaire completion. Parental consent was obtained for all study participants younger than 18 years; participants older than 18 years provided self-consent.

The Brain Injury Screening Questionnaire

Both the Pediatric and the Adult versions of the BISQ-G were utilized for this study. All participants were asked to answer the second part of the BISQ-G questionnaire. By answering the second part of the BISQ-G, important information was provided regarding any physical, cognitive, and behavioral symptoms experienced during the last month on a daily basis. The Part B of the BISQ-G did not differ between the two different versions of the questionnaire (Pediatric and Adult); therefore, its factor structure is expected to follow the same pattern for both versions.

The Pediatric and the Adult versions of the BISQ-G questionnaires are described in more detail under the Materials section.

Materials

The BISQ-G was created by the Research and Training Center on Community Integration of Individuals with TBI in 1997 to determine whether a person or a group of persons exhibits a symptomatology indicative of TBI. Adaptation into Greek was conducted by Constantinidou (2009) upon permission from the authors for the adult and pediatric versions. In addition, items pertaining to demographics were adapted to be consistent with the Cypriot census data. The final version of the test was administered to 20 volunteers for further refinement. Parents of elementary school children completed the child version; secondary and university students completed the adult version.

The BISQ is described as the only measure of its kind that documents (1) events that can result in a brain injury, (2) functional difficulties and symptoms associated with brain injury, and (3) events and conditions other than brain injury that might lead to symptoms similar to those seen in brain injury (Cantor et al., 2004). Thus, it provides crucial information for determining whether the American Congress of Rehabilitation Medicine criteria are met for mild brain injury (i.e., blow to the head, altered mental status), as well as for documenting what functional impairments are present and how frequently they occur and for assessing whether these impairments are likely associated with factors other than head injury (e.g., psychiatric disorders, medication use, substance abuse). It has been shown to reliably distinguish between brain injury and other conditions (e.g., spinal cord injury) including the absence of disability (Cantor et al., 2004; Gordon, Haddad, Brown, Hibbard, & Sliwinski, 2000; McFadden et al., 2011).

The BISQ is divided into four sections: Introduction, Part 1, Part 2, and Part 3. The introductory section inquires demographic information about the child or the family. Part 1 (Injuries and Hospitalizations) asks whether the participant has ever experienced a blow to the head as a result of 19 given situations, as well as how many times the person has been dazed or confused after the situation. Part 2 is titled "Problems and Difficulties in Daily Living" and consists of 100 symptoms divided into three areas: a physical scale of 19 symptoms, a cognitive scale of 48 symptoms, and a behavioral scale of 33 symptoms (Hibbard et al., 2004). Participants are asked to identify any symptoms that have interfered with their ability to function on most days during the prior month using a 6-point anchored Likert scale. Part 3 (Additional Questions) includes questions that are designed to examine potential comorbidities that could account for symptom report, for example, whether the subject is on any medication currently, or whether there is a history or a diagnosis of a condition which its symptomatology resembles TBI's symptomatology (Gordon, 2004). All of the parts of the questionnaire were completed by the participants.

Data analysis

To test the hypothesis about the proportion of children with a positive screen for TBI, data were analyzed using the Statistical Package for the Social Sciences (SPSS; 19). All of the BISQ-G data were first analyzed in MS ACCESS. For each participant, a report was generated with important demographic information, prior injury, symptomatology exhibited, and other important information. The analyses provided information on whether the participant's history and symptom profile indicated high, moderate, or low probability for TBI (i.e., positive screen) or no probability for TBI (i.e., negative screen). Because of the small number of participants falling in each of the three probability level groups, all positive screens were grouped together and formed one single group and were subsequently compared with the negative screens. Data from each participant were subsequently analyzed in SPSS using the χ^2 analysis (Crosstabs) to determine epidemiological factors of pediatric TBI in Cyprus, such as risk factors, causes, implications, and demographic variables.

Factor analysis was used to examine the structure of the questionnaire used in this study. The analysis was used to examine whether any clusters of symptoms might come up from the participants' answers to the BISQ-G.

RESULTS

Incidence and cause of TBI

Out of the total 1,266 participants, 137 (10.82%) students were rated as being positive for TBI. Specifically, 41 (5.8%) of the total elementary school students, 23 (9.7%) of the total high school students, and 73 (22.7%) of the total university students were rated as TBI positive (see Table 1). Four hundred eighty (47.1%) students reported having sustained at

Table 1. Number of students with a positive traumatic brain injury screening ($N = 1266$)

Age Group	*N* for Positive Screening	Percentage
Elementary school students	41	5.8
High school students	23	9.7
University students	73	22.7

least one blow to the head. The number of blows reported varied widely among participants (0–24 blows) with an average of 1.67 ± 2.89 (Table 2). Out of the 480 participants, 281 were male and 103 were female students ($\chi^2_2 = 3.27$, $p = .367$). Of the 480 students with a positive history of blows to the head, 105 or 21.87% were screened positive for TBI. Only 9 participants out of 535 (1.7%), who did not report a blow to the head, were screened positive for TBI by the BISQ-G, with a probability of Brain Injury not being excluded. There was a significant difference between the two groups (positive vs. negative screened participants) regarding the number of blows to the head ($\chi^2_{18} = 181.66$, $p < .001$), indicating that having sustained a blow to the head increases the risk for TBI.

Causes of blows to the head

Most of the blows to the head were reported to have occurred during a sport or playground activity and following a fall (see Table 3).

Medical conditions and TBI

Out of the 1,266 respondents, 254 students (27.4%) reported that they had been hospitalized or seen in an emergency department for various reasons, at least once, with an average of 1.68 ± 0.52 hospitalizations. Data regarding hospitalization for the 137 students screened as positive to the probability of TBI were included in these data. A more detailed analysis indicated that 78 of these students had been hospitalized or seen in an emergency department whereas 35 had never been hospitalized or seen in an emergency department. Table 4 presents the number of students who had been hospitalized or seen in an emergency department. For all incidences requiring hospitalization, there were significant differences between the two groups with children with a positive screen for TBI being hospitalized significantly more often ($\chi^2_2 = 112.48$, $p < .001$).

Table 2. Number of blows to the head

Valid	Frequency	Percentage
0	535	52.9
1	158	15.6
2	81	8.0
3	73	7.2
4	42	4.2
5	31	3.1
8	9	0.9
10	8	0.8
12	4	0.4
24	1	0.1
Total	942	100

Number of episodes of loss of consciousness and being dazed and confused

Not surprisingly, significantly more episodes of being dazed and confused (DAC), or losing consciousness, were reported for children with a positive screen for TBI than for children with a negative screen for TBI ($\chi^2_3 = 664.8$, $p < .001$). Four hundred sixty students responded positively to a question investigating whether they had ever been DAC or lost consciousness after an incident of a blow to the head or after an emergency medical condition (see Table 5). Two hundred four (44.35%) of these students were screened positive for TBI whereas 256 (55.65%) students were screened negative for TBI. The majority of students ($N = 68$) having lost consciousness remained in that condition for less than 20 min. Loss of consciousness (LOC) of 1–24 hr was reported for four students and LOC for a period of more than 24 hr was reported for two students. The majority of the 152 students being DAC ($N = 51$) were reported as experiencing this condition for 1–10 min. Thirty-four students were DAC for less than 1 min, eight students for 11–20 min, 10 for 21 min to 1 hr, 12 for 1–24 hr, and four for more than 1 day.

Factorial validity of the Part B, Symptoms Checklist, of the BISQ-G

A factor analysis was conducted in regard to the symptoms reported by the participants in the BISQ-G. Out of the 1,266 participants, 924 completed the Part B, Symptoms checklist, of

Table 3. Number of students with a positive traumatic brain injury screening ($N = 137$) for each blow type

Type of Blow to the Head	One Blow	Multiple Blows
Blow in a car/van/bus crash	19	1
In a motorcycle or all-terrain vehicle crash	2	3
As a pedestrian hit by a vehicle	7	0
Being hit by a falling object	14	4
Being hit by equipment	18	7
Falling down from stairs	25	6
Falling from high place	25	8
Falling during a fainting spell	25	4
Falling during a drug or alcohol blackout	4	0
While biking	27	7
While rollerblading or skateboarding	11	3
While horseback riding	1	0
While skiing or snowboarding	1	0
In sports	35	5
While on the playground	21	4
While diving into water	8	0
Being assaulted or mugged	3	2
Being physically abused	4	2
Other	8	2

the instrument, and were, therefore, included in the analysis. Reliability analysis yielded a Cronbach's α index of 0.992, indicating that the BISQ-G is a reliable measure of TBI-related symptoms. No item appeared to lower this index and, therefore, all items were included in the analyses. The factor analysis (with varimax rotation) indicated the existence of seven factors with eigenvalues greater than 1, explaining a total of 72.7% of the variance. The item loadings appeared to be distributed to the seven factors as seen in Table 6.

Table 4. Number of students with a positive traumatic brain injury screening ($N = 137$) and had been hospitalized or seen in an emergency department

	Hospitalized		
Type of Injury or Medical Condition	One Time	Two Times	Three Times
Concussion	17	3	0
Fracture of the head	26	7	5
Seizures	9	3	1
High fever	27	8	14
Near drowning incident or poisoning	15	0	2
Electrical injury or been hit by lightning	2	1	0
Stroke or brain hemorrhage	1	0	0
Brain infection or tumor	2	0	0
Other reasons	17	5	8

Table 5. Number of episodes of loss of consciousness and being dazed and confused as reported by participants

		Being Dazed and Confused or Lost Consciousness			
		Never Happened	Yes	Do Not Know	Total
Negative screen for TBI	Count	808	43	45	970
Positive screen for TBI	Count	9	118	8	135
Total	Count	817	161	53	1,105

Note. TBI = traumatic brain injury.

The first factor comprised 15 items that relate to long-term memory and cognition (e.g., friends or relatives seeming unfamiliar, getting lost, thinking slowly) and sensory problems related to smell and taste (e.g., food not tasting right, having difficulty smelling things; $\alpha =$ .966). The second factor consisted of 20 items relating to verbal communication and understanding deficiencies (e.g., difficulty making conversation, difficulty understanding jokes and humor, experiencing others as talking too fast) and learning difficulties (e.g., difficulty learning new skills, reading very slowly, having difficulty understanding what was read; α = .968). Items investigating somatic formed the third factor (e.g., feeling dizzy, having trouble staying awake, having little appetite, losing balance; 13 items; α = .950). The fourth factor consisted of 21 items relating to emotional difficulties (e.g., feeling hopeless or worthless, feeling moody, having difficulty getting started on things; α = .971). The fifth factor comprised 13 items inquiring about impulse control (e.g., being impulsive, being heedless to danger, hitting, or pushing others; α = .955). Items involving executive and planning abilities formed the sixth factor (e.g., difficulty planning future events, forgetting to take medication, losing track of time; 13 items; α = .948). The seventh factor consisted of five items inquiring about attention (e.g., being easily distracted, difficulties in concentration and attention, losing train of thought; α = .928).

DISCUSSION

To date, there is lack of systematic research on the prevalence of TBI in school-aged persons in the Republic of Cyprus. Therefore, there is no policy on the identification and management of deficits associated with TBI. This study is part of a larger systematic effort to investigate the incidence and effects of TBI within the Cypriot population. The purpose of this study was to investigate the incidence of school-aged children, adolescents, and young adults with a probability of having sustained a TBI.

The results of this study indicate that close to 50% of students and young adults (n = 480, 47.1%) experience one or more incidents potentially resulting in brain injury. Out of these children, adolescents, and young adults, about 10.82% (137 participants out of 1,266) have actually sustained a probable TBI. More specifically, 5.8% of elementary school students, 9.7% of high school students, and 22.7% of university students were rated as TBI positive. The present findings are consistent with previous research conducted in the United States. Hux et al. (2013) administered a questionnaire to the parents and guardians of 692 first- to fifth-grade students in a metropolitan school district of a Midwestern state to determine the prevalence of potential brain injury incidents in a nonclinical population of elementary school-aged children. Similarly to the current study, results demonstrated that 5.6% of

Table 6. Factor loadings for the BISQ-G symptoms-rotated component matrix[a]

	Component						
	1	**2**	**3**	**4**	**5**	**6**	**7**
Friends or relatives seeming unfamiliar	0.760						
Forgetting names of people, including family members	0.713						
Becoming confused in familiar places	0.692						
Having difficulty smelling things	0.662						
Getting lost	0.648						
Food not tasting right	0.591						
Blacking out or having seizures	0.586						
Having double vision or blurred vision	0.559						
Forgetting to eat	0.547						
Forgetting well-known phone numbers or addresses	0.528						
Thinking slowly	0.508						
Being disorganized	0.474						
Forgetting names of objects, trouble expressing thoughts	0.461						
Moving slowly	0.434						
Misplacing things, forgetting where things are	0.373						
Reading very slowly, having difficulty reading		0.684					
Learning slowly		0.674					
Difficulties with reading, writing, and math		0.649					
Writing slowly		0.638					
Having difficulty understanding what was read, or what is read to		0.622					
Difficulty in performing chores		0.609					
Speech difficulties, trouble understanding conversation, or difficulty pronouncing words		0.590					
Difficulty following instructions, written or oral		0.585					
Forgetting what was just read		0.567					
Difficulty learning new skills and new information		0.566					
Writing illegibly, poor handwriting		0.545					
Difficulty making conversation		0.539					
Speaking in ways that others cannot make sense of		0.537					
Difficulty in understanding jokes and humor		0.524					
Difficulty learning from experience		0.512					
Repeating what others say		0.499					

(*continues*)

Table 6. Factor loadings for the BISQ-G symptoms-rotated component matrix[a] (*Continued*)

	Component						
	1	**2**	**3**	**4**	**5**	**6**	**7**
Talking too fast or too slow		0.469					
Making comments that are inappropriate		0.460					
Making spelling mistakes		0.415					
Experiencing others as talking too fast		0.414					
Feeling dizzy			0.702				
Having trouble falling asleep or staying asleep			0.661				
Having trouble waking up after sleep			0.648				
Experiencing ringing in the ears or trouble hearing			0.644				
Losing balance			0.635				
Having trouble staying awake			0.625				
Having nightmares			0.622				
Being clumsy, dropping, or tripping over things			0.590				
Feeling tired			0.578				
Having headaches			0.565				
Having little or no appetite			0.564				
Eating too much			0.481				
Feeling sad or blue				0.671			
Feeling misunderstood				0.636			
Feeling moody				0.618			
Feeling hopeless, worthless				0.615			
Not feeling confident				0.608			
Feeling uncomfortable around others				0.566			
Difficulty coping with unexpected changes				0.565			
Experiencing difficulties being in crowds				0.551			
Feeling frustrated				0.520			
Experiencing rapid changes in mood				0.516			
Feeling scared or frightened				0.504			
Feeling lonely				0.503			
Feeling life is not worth living, expressing thoughts about wanting to die				0.496			
Having repeated thoughts				0.496			
Dealing with people				0.491			
Sitting around doing nothing, feeling bored				0.479			
Crying easily or for no reason				0.476			
Having difficulty getting started on things				0.471			
Avoiding family members or friends				0.463			

(*continues*)

Table 6. Factor loadings for the BISQ-G symptoms-rotated component matrix[a] (*Continued*)

	Component						
	1	**2**	**3**	**4**	**5**	**6**	**7**
Feeling impatient or irritable				0.407			
Laughing for no reason				0.397			
Arguing					0.689		
Screaming or yelling, having temper outbursts					0.674		
Feeling angry					0.627		
Being heedless to danger, as in driving recklessly					0.607		
Cursing at or threatening others or self					0.589		
Hitting or pushing others					0.584		
Being rude to others, interrupting others					0.569		
Not listening when being spoken to					0.536		
Doing things without thinking them through, being impulsive					0.522		
Talking too much					0.522		
Feeling jumpy, restless, or unable to stay still					0.483		
Behaving inappropriately					0.442		
Difficulty planning future events					0.634		
Forgetting, missing, or being late for appointments					0.608		
Handling personal affairs and finances					0.579		
Forgetting to turn off appliances					0.569		
Difficulty setting priorities					0.565		
Forgetting to take medications					0.543		
Increased or decreased sexual interest					0.527		
Difficulty making decisions					0.490		
Difficulty solving problems					0.435		
Unexplained change in performance at work or school					0.418		
Forgetting doing chores, homework, work at home					0.405		
Forgetting if things are done					0.403		
Losing track of time					0.381		
Being easily distracted					0.609		
Forgetting what just said					0.606		
Difficulty concentrating, having poor attention span					0.561		
Losing train of thought					0.535		
Forgetting what happened yesterday or recent events					0.479		

[a]Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

the regular education students received positive screens for brain injury. In addition, 25.4% of the special education students in the study by Hux et al. (2013) received positive screens for brain injury.

The present findings indicate that blow to the head was the predominant cause of TBI. The risk for sustaining a TBI increased with subsequent blows to the head as a number of parents of participants with a positive screen for TBI reported one or more blows to the head during an involvement in specific situations or activities. Within our population, more males sustained a blow to the head than females. This is consistent with the literature where Bruns and Hauser (2003) reported that males were uniformly at higher risk of TBI than females.

The predominant causes of blows to the head in Cyprus included injuries during sports or playground activities, falls, and hits by falling objects and equipment. The present study was consistent with the study by Cantor et al. (2004), who also reported that sports was the primary cause of blows to the head, whereas Bruns and Hauser (2003) also reported that falls were a primary cause of injury in children. On the contrary, activities not appearing often within the Cypriot culture resulted in no injuries or testified no occurrence (e.g., falling while rollerblading or skateboarding, falling while horseback riding, falling while skiing or snowboarding).

Students with a positive screen for TBI had experienced one or more blows to the head. Hence, children, adolescents, and young adults who sustain blows to the head and especially those who are prone to multiple injuries are at risk for TBI. This is comparable with Moser et al. (2007), who state that multiple head injuries increase the risk of having another head injury resulting in TBI. In addition, this finding supports Peron and Howard (2008), who state that minor blows to the head can result in brain damage, especially if they are recurrent.

As it has already been suggested in the literature, children and adults do not always seek medical help after a head injury. The BISQ-G revealed that out of the 137 participants who were screened positive for TBI by the BISQ-G, 78 (56.9%) were hospitalized or seen in an emergency department. This information has significant value because the BISQ-G has the ability to identify individuals with a symptomatology that is TBI-related who have never been formally treated after a head injury. The percentage reported previously does not fall far from the percentages reported in the literature of individuals who seek medical help following a head injury. In the case of Setnik and Bazarian (2007), 58% of the adult sample tested sought medical help, and those less likely to seek care were older, suffered a mild TBI, or were injured in the home. The percentage of individuals requesting medical help in this study may be higher, due to the fact that the population consisted of children, adolescents, and young adults, and, therefore, parents may be more alert to their child's injuries, rushing them to the emergency department. Participants with a positive screen for TBI were hospitalized or seen in an emergency department significantly more often than participants with a negative screen for TBI. More specifically, participants with a positive screen appeared to seek medical help more often because of a concussion, a fracture of the head/neck or face, seizures, high fever, drowning or poisoning, electrical injury or hit by lightning, brain infection or tumor, or other reason.

More episodes of having been dazed and confused, or losing consciousness, were reported for participants with a positive screen for TBI than for those with a negative screen for TBI. The majority of students having lost consciousness remained in that condition for less than 20 min, suggestive of a probability of mild concussion. This result is consistent with research showing that 80%–90% of TBIs are mild. It also agrees with the research conducted by Cantor et al. (2004), which suggests that episodes of LOC did not last long. Those children who had experienced LOC and DAC are considered to be at a greater risk for TBI.

The factorial structure and validity of the BISQ-G's Symptom checklist generated a seven-factor structure and not a three-factor structure as it was originally hypothesized on the basis of the original U.S. version by Gordon (2004). The BISQ-G seven-factor structure consists of (1) long-term memory, cognition, and sensory problems; (2) verbal communication and comprehension deficits; (3) somatic symptoms; (4) emotional difficulties; (5) impulse control; (6) executive and planning abilities, and (7) attention. This study incorporated a larger sample size than the original project by Gordon (2004); however, this is the only methodological difference with the original study. It is not clear to the authors why the Greek version of the instrument resulted in different factor structure; nevertheless, the results support the ongoing efforts in validating instruments in different languages and cultures as it is not uncommon for adapted tools to generate different factor structures than the original instrument (Demetriadou, Michaelides, Bateman, & Constantinidou, 2018). The factorial validity of the BISQ-G will allow the further investigation of the symptomatology of patients with a history of TBI, as well as the development of appropriate treatment plans.

CLINICAL IMPLICATIONS AND FINAL CONCLUSIONS

In conclusion, this study indicates that the BISQ-G is a useful instrument that can be implemented in the systematic screening for concussion across the school spectrum from elementary through tertiary education. Moreover, it provides guidance for the Cypriot school systems for allocation of resources for the identification and management of neurobehavioral deficits associated with brain injury. Current findings indicate that a considerable number of students across the education spectrum in Cyprus have undocumented injuries resulting in neurobehavioral symptoms that can interfere with educational endeavors and psychosocial functioning. In specifics, in the intake information of the Cyprus Educational Psychology Service, the history of TBI is not included and, further, not comprising a diagnostic category. Therefore, a sizeable number of students, across the academic continuum, from primary, secondary, and higher education, are not being detected, monitored, or treated appropriately and are exhibiting ongoing difficulties. Policies are required to be made in order for the early detection and treatment of students having sustained TBI.

REFERENCES

Allen, B. B., Chiu, Y. L., Gerber, L. M., Ghajar, J., & Greenfield, J. P. (2014). Age-specific cerebral perfusion pressure thresholds and survival in children and adolescents with severe traumatic brain injury. *Pediatric Critical Care Medicine*, *15*(1), 62–70.

Anderson, V., Catroppa, C., Haritou, F., Morse, S., & Rosenfeld, J. (2005). Identifying factors contributing to child and family outcome 30 months after traumatic brain injury in children. *Journal of Neurology, Neurosurgery, and Psychiatry*, *76*(3), 401–408.

Annegers, J. F., & Pasternak Coan, S. (2000). The risks of epilepsy after traumatic brain injury. *Seizure*, *9*, 453–457.

Bruns, J. Jr., & Hauser, W. A. (2003). The epidemiology of traumatic brain injury: A review. *Epilepsia*, *44*(10), 2–10.

Cancelliere, C., Cassidy, J. D., Côté, P., Hincapié, C. A., Hartvigsen, J., Carroll, L. J., et al. (2012). Protocol for a systematic review of prognosis after mild traumatic brain injury: An update of the WHO Collaborating Centre Task Force findings. *Systematic Reviews*, *1*(1), 17.

Cantor, J. B., Gordon, W. A., & Ashman, T. A. (2006). Screening for brain injury in school children. *Journal of Head Trauma Rehabilitation*, *21*, 424–435.

Cantor, J. B., Gordon, W. A., Schawartz, M. E., Charatz, H. J., Ashman, T. A., & Abramowitz, S. (2004). Child and parent responses to a brain injury screening questionnaire. *Archives of Physical Medicine and Rehabilitation*, *85*, 54–60.

Catroppa, C., Anderson, V. A., Morse, S. A., Haritou, F., & Rosenfeld, J. V. (2008). Outcome and predictors of functional recovery 5 years following pediatric traumatic brain injury (TBI). *Journal of Pediatric Psychology*, *33*(7), 707–718.

Centers for Disease Control and Prevention. (2015). *Report to congress on traumatic brain injury in the United States: Epidemiology and rehabilitation*. Atlanta, GA: National Center for Injury Prevention and Control; Division of Unintentional Injury Prevention.

Centers for Disease Control and Prevention. (2016). *Traumatic brain injury in the United States: Fact sheet*.

Atlanta, GA: U.S. Department of Health & Human Services.

Chapman, S. B. (2006). Neurocognitive stall: A paradox in long term recovery from pediatric brain injury. *Brain Injury Professional*, *3*, 10–13.

Chesire, D. J., Buckley, V. A., Leach, S. L., Scott, R. A., & Scott, K. K. (2015, September). Navigating the terrain in the identification and program development for children with mild traumatic brain injuries. In *School Psychology Forum, 9*(3), 199–213.

Constantinidou, F. (2009). *Greek version of the Brain Injury Screening Questionnaire*. Unpublished dissertation. University of Cyprus, Nicosia, Cyprus.

DeGrauw, X., Thurman, D., Xu, L., Kancherla, V., & DeGrauw, T. (2018). Epidemiology of traumatic brain injury-associated epilepsy and early use of anti-epilepsy drugs: An analysis of insurance claims data, 2004–2014. *Epilepsy Research*, *146*, 41–49.

Demetriadou, M., Michaelides, M., Bateman, A., & Constantinidou, F. (2018). Measurement of everyday dysexecutive symptoms in normal aging with the Greek version of the Dysexecutive Questionnaire-Revised. *Neuropsychological Rehabilitation*, *28*(1), 1–20. doi:10.1080/09602011.2018.1543127

Gordon, W. A. (2004). Community integration of people with traumatic brain injury: Introduction. *Archives of Physical Medicine and Rehabilitation*, *85*(2), 1–2.

Gordon, W. A., Haddad, L., Brown, M., Hibbard, M. R., & Sliwinski, M. (2000). The sensitivity and specificity of self-reported symptoms in individuals with traumatic brain injury. *Brain Injury*, *14*(1), 21–33.

Gorman, S., Barnes, M. A., Swank, P. R., & Ewing-Cobbs, L. (2017). Recovery of working memory following pediatric traumatic brain injury: A longitudinal analysis. *Developmental Neuropsychology*, *42*(3), 127–145.

Haarbauer-Krupa, J., Ciccia, A., Dodd, J., Ettel, D., Kurowski, B., Lumba-Brown, A., et al. (2017). Service delivery in the healthcare and educational systems for children following traumatic brain injury: Gaps in care. *Journal of Head Trauma Rehabilitation*, *32*(6), 367–377.

Hibbard, M. R., Ashman, T. A., Spielman, L. A., Chun, D., Charatz, H. J., & Melvin, S. (2004). Relationship between depression and psychosocial functioning after traumatic brain injury. *Archives of Physical Medicine and Rehabilitation*, *85*(4), 43–53.

Hux, K., Dymacek, R., & Childers, C. (2013). Possible brain injury events and symptoms in elementary school children. *Brain Injury*, *27*(12), 1348–1355. doi:10.3109/02699052.2013.823657

Hux, K., Schneider, T., & Bennett, K. (2009). Screening for traumatic brain injury. *Brain Injury*, *23*(1), 8–14.

Ichkova, A., Rodriguez-Grande, B., Bar, C., Villega, F., Konsman, J. P., & Badaut, J. (2017). Vascular impairment as a pathological mechanism underlying long-lasting cognitive dysfunction after pediatric traumatic brain injury. *Neurochemistry International*, *111*, 93–102.

Individuals with Disability Education Act Amendments of 1997 [IDEA] (1997). Retrieved from https://www.congress.gov/105/plaws/publ17/PLAW-105publ17.pdf

Karver, C. L., Wade, S. L., Cassedy, A., Taylor, H. G., Stancin, T., Yeates, K. O., et al. (2012). Age at injury and long-term behavior problems after traumatic brain injury in young children. *Rehabilitation Psychology*, *57*(3), 256.

Lavoie, S., Sechrist, S., Quach, N., Ehsanian, R., Duong, T., Gotlib, I. H., et al. (2017). Depression in men and women one year following traumatic brain injury (TBI): A TBI Model Systems Study. *Frontiers in Psychology*, *8*, 634.

Lowther, J. L., & Mayfield, J. (2004). Memory functioning in children with traumatic brain injuries: A TOMAL validity study. *Archives of Clinical Neuropsychology*, *19*(1), 105–118.

Mauri, M. C., Paletta, S., Colasanti, A., Miserocchi, G., & Altamura, A. C. (2014). Clinical and neuropsychological correlates of major depression following post-traumatic brain injury, a prospective study. *Asian Journal of Psychiatry*, *12*, 118–124.

McFadden, K. L., Healy, K. L., Dettmann, M. L., Kaye, J. T., Ito, T. A., & Hernández, T. D. (2011). Acupressure as a non-pharmacological intervention for traumatic brain injury (TBI). *Journal of Neurotrauma*, *28*(1), 21–34. doi:10.1089/neu.2010.1515

Moser, R. S., Iverson, G. L., Echemendia, R. J., Lovell, M. R., Schatz, P., Webbe, F. M., et al. (2007). Neuropsychological evaluation in the diagnosis and management of sports-related concussion. *Archives of Clinical Neuropsychology*, *22*(8), 909–916.

Mychasiuk, R., Farran, A., & Esser, M. J. (2014). Assessment of an experimental rodent model of pediatric mild traumatic brain injury. *Journal of Neurotrauma*, *31*(8), 749–757.

National Institute of Neurological Disorders and Stroke. (2018). *Traumatic Brain Injury Information Page*. Retrieved from https://www.ninds.nih.gov/Disorders/All-Disorders/Traumatic-Brain-Injury-Information-Page#disorders-r2

Pearn, M. L., Niesman, I. R., Egawa, J., Sawada, A., Almenar-Queralt, A., Shah, S. B., et al. (2017). Pathophysiology associated with traumatic brain injury: Current treatments and potential novel therapeutics. *Cellular and Molecular Neurobiology*, *37*(4), 571–585.

Peron, B. E., & Howard, M. O. (2008). Prevalence and correlates of traumatic brain injury among delinquent youths. *Criminal Behavior and Mental Health*, *18*(4), 243–255.

Prasad, M. R., Swank, P. R., & Ewing-Cobbs, L. (2017). Long-term school outcomes of children and adolescents with traumatic brain injury. *The Journal of Head Trauma Rehabilitation*, *32*(1), E24.

Rivara, F. P., Koepsell, T. D., Wang, J., Temkin, N., Dorsch, A., Vavilala, M. S., et al. (2011). Disability 3, 12, and 24 months after traumatic brain injury among children and adolescents. *Pediatrics*, *128*(5):e1129-e1138. doi:10.1542/peds.2011-0840

Robinson, S., Winer, J., Chan, L., Oppong, A. Y., Yellowhair, T. R., Maxwell, J., et al. (2018). Extended erythropoietin treatment prevents chronic executive functional and microstructural deficits following early severe traumatic brain injury in rats. *Frontiers in Neurology*, *9*, 451.

Sariaslan, A., Sharp, D. J., D'Onofrio, B. M., Larsson, H., & Fazel, S. (2016). Long-term outcomes associated with traumatic brain injury in childhood and adolescence: A nationwide Swedish cohort study of a wide range of medical and social outcomes. *PLoS Medicine*, *13*(8), e1002103.

Savage, R. C. (1991). Identification, classification, and placement issues for students with traumatic brain injuries. *Journal of Head Trauma Rehabilitation*, *6*, 1–9.

Setnik, L., & Bazarian, J. J. (2007). The characteristics of patients who do not seek medical treatment for traumatic brain injury. *Brain Injury*, *21*(1), 1–9.

Sikka, S., Vrooman, A., Callender, L., Salisbury, D., Bennett, M., Hamilton, R., et al. (2017). Inconsistencies with screening for traumatic brain injury in spinal cord injury across the continuum of care. *The Journal of Spinal Cord Medicine*, *42*(1), 1–10.

Special Education Act of the Cypriot Legislation 113(I) 1999. Retrieved from http://www.moec.gov.cy/en/pdf/special_education_law_113(I)_1999.pdf

Taylor, C. A., Bell, J. M., Breidin, M. J., & Xu, L. (2017). Traumatic brain injury-related emergency department visits, hospitalizations, and deaths—United States, 2007 and 2013. *Morbidity and Mortality Weekly Report. Surveillance Summaries (Washington, DC: 2002)*, *66*(9), 1–16.

Taylor, H. G., Swartwout, M., Yeates, K. O., Walz, N. C., Stancin, T., & Wade, S. L. (2008). Traumatic brain injury in young children: post-acute effects on cognitive and school readiness skills. *Journal of the International Neuropsychological Society*, *14*(5), 734–745.

Taylor, H. G., Yeates, K. O., Wade, S. L., Drotar, D., Stancin, T., & Burant, C. (2001). Bidirectional child–family influences on outcomes of traumatic brain injury in children. *Journal of the International Neuropsychological Society*, *7*(6), 755–767.

Thurman, D. J., Begley, C. E., Carpio, A., Helmers, S., Hesdorffer, D. C., Mu, J., et al. (2018). The primary prevention of epilepsy: A report of the Prevention Task Force of the International League Against Epilepsy. *Epilepsia*, *59*(5), 905–914.

Toledo, E., Lebel, A., Becerra, L., Minter, A., Linnman, C., Maleki, N., et al. (2012). The young brain and concussion: Imaging as a biomarker for diagnosis and prognosis. *Neuroscience & Biobehavioral Reviews*, *36*(6), 1510–1531.

U.S. Department of Health and Human Services. (2006). Health, United States, 2006, with chartbook on trends in the health of Americans. Retrieved from https://www.cdc.gov/nchs/data/hus/hus06.pdf.

Verhaeghe, S., Defloor, T., & Grypdonck, M. (2005). Stress and coping among families of patients with traumatic brain injury: A review of the literature. *Journal of Clinical Nursing*, *14*(8), 1004–1012.

Wade, S. L., Cassedy, A., Walz, N. C., Taylor, H. G., Stancin, T., & Yeates, K. O. (2011). The relationship of parental warm responsiveness and negativity to emerging behavior problems following traumatic brain injury in young children. *Developmental Psychology*, *47*(1), 119.

Wozniak, J. R., Krach, L., Ward, E., Mueller, B. A., Muetzel, R., Schnoebelen, S., et al. (2007). Neurocognitive and neuroimaging correlates of pediatric traumatic brain injury: A diffusion tensor imaging (DTI) study. *Archives of Clinical Neuropsychology*, *22*(5), 555–568.

Ylvisaker, M., Todis, B., Glang, A., Urbanczyk, B., Franklin, C., DePompei, R., et al. (2001). Educating students with TBI: Themes and recommendations. *Journal of Head Trauma Rehabilitation*, *16*(1), 76–93.