THESIS

SENSITIVITY AND SPECIFICITY ANALYSIS OF THE BRAIN CHECK SURVEY: SCREENING STUDENTS FOR TBI

Submitted by

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ABSTRACT

SENSITIVITY AND SPECIFICITY OF THE BRAIN CHECK SURVEY:

SCREENING STUDENTS FOR TBI

Improving educational results for children with disabilities is an essential goal of the Individuals with Disabilities Education Improvement Act of 2004 (P.L 108-446), in order to ensure, "equality of opportunity, full participation, independent living, and economic self-sufficiency" (20 U.S.C. § 601.C.1). Though traumatic brain injury was added into IDEA law in 1990 (P.L 101-476), as a separate category, children with traumatic brain injury (TBI) remain under-identified in schools and therefore lack appropriate educational supports to ensure optimal participation and subsequent educational achievement. Because TBI can greatly impact a student's school and future success, there is a need for an effective and efficient way to screen for TBI in students who are struggling in school. The purpose of this study was to examine the sensitivity and specificity of the Brain Check Survey (BCS); and establish a cut-off score, in the parent-report tool designed to help school personnel screen students for possible TBI. In searching to identify students for possible TBI, the BCS can act as a starting point in the process for qualifying students for Special Education, a 504 plan, or Response to Intervention (RTI) assistance. Data for this study were gathered from parents from five different school districts in Colorado, who completed the BCS for their child whom was selected from one of two groups: 1) child was receiving special education services for a medically-diagnosed TBI, or 2) child was considered typically developing. This study used the data from 479 completed surveys to determine the sensitivity and specificity of the BCS tool using receiver operator characteristics

(ROC) curves. Analysis determined the BCS to have strong sensitivity and specificity. These findings, combined with recent findings from factor, reliability, and validity analysis (Pickle, 2013; Sample, Greene, Rieger, and Mathias, submitted), have resulted in the determination that the BCS can be used effectively in screening students for possible TBI.

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Literature Review

Traumatic Brain Injury (TBI) is caused by a bump, blow or jolt to the head or a penetrating injury that disrupts normal function of the brain and may be classified from "mild" to "severe" (Connor et al., 2001). TBI is a contributing factor to a third of all injury-related deaths in the United States, with an estimated 1.7 million individuals sustaining a TBI annually (Faul, Xu, Wald, & Coronado, 2010). Of those numbers, each year approximately 40% belong to the pediatric population (ages birth-19 years), making TBI one of the leading causes of death and disability among children (Faul, Xu, Wald, & Coronado, 2010). The Centers for Disease Control and Prevention (2013) estimates that more than 62,000 children and adolescents are hospitalized annually in the United States after sustaining moderate to severe brain injuries from motor vehicle crashes, falls, sports, and physical abuse; and an additional 631,146 children are seen in a hospital emergency room and released (Faul et al., 2010). In 2005, researchers estimated that nearly 145,000 children, ages birth to 19 years, were currently living with the long-lasting physical, social, behavioral, and cognitive-functioning difficulties following a TBI (Zaloshnja, Miller, Langlois, & Selassie, 2008).

TBI can significantly impact a student's ability in multiple areas of functioning, and the effects in children are particularly complex, since the injury occurs to a developing brain. In many cases of childhood TBI the injury is not realized until the child already has begun struggling in school (Dettmer, Daunhauer, Detmar-Hanna, & Sample, 2007; Glang, Tyler, Pearson, Todis, & Morvant, 2004). In addition to cognitive effects—including problems in memory, attention, and executive functioning—children (particularly with pre-frontal lobe injuries), may display behavioral patterns characterized by aggression, disinhibition, social

withdrawal, or apathy (Savage, DePompei, Tyler, & Lash, 2005). TBI symptoms and resulting problems continue long after a youth's initial incident as well. A study by Hooper et al. (2004), found that about 10% of participants with TBI were reported to be experiencing a new learning and/or behavior problem after returning to school following an injury, even at a 10-month follow-up. Further, as Glang et al. (2008) detailed, long term follow-up studies of children K-12 have indicated that problems associated with TBI tend to persist or even worsen as the child ages and progresses through school. While students with TBI may first appear to be doing fine in school, they may experience more problems later when school demands increase (Hooper et al., 2004; Savage, Pearson, McDonald, Potoczny-Gray, & Marchese, 2001); a vulnerability especially true in cases when the injury occurs very early in the child's life. Over time, these children may fall further and further behind their same-aged peers academically, socially, and behaviorally, leaving them vulnerable to multiple risk factors associated with school failure (Glang et al., 2008).

Nevertheless, while TBI may very well be a high-incidence event, it retains low-incidence disability status in the field of special education (Glang et al., 2004). Although students with TBI have been eligible to receive special education services under the Individuals with Disabilities Education Act since 1990 (P.L 101-476), according to the most recent U.S Department of Education (US-DOE) report (2011), the total number of students served on Individual Educational Plans (IEPs) under the category of TBI is a mere 24,602. This discrepancy between the tens-of-thousands of children who are impacted by a TBI, and those who actually receive services, raises serious questions regarding the current practices of TBI identification and implementation of IEP-based services for children with TBI. Additionally, under-categorization and poor tracking of children with TBI continue to perpetuate a cycle of

inadequate resources being directed towards school students with TBI (Dettmer, Ettel, Glang, & McAvoy, 2013).

Multiple reasons likely exist for the low rates of identification of children with TBI in schools, beginning with poor or nonexistent links between medical professionals/ hospitals and schools (Dettmer et al., 2013; Glang et al., 2008; Hawley, 2004; Savage et al., 2001). Lack of referral for services, reliance on family members to report the brain injury to the school, and overall poor communication between parties contribute to decreased identification of children with TBI for formal school services (Cantor et al., 2004; Glang et al., 2008). Although informing schools that a student has been medically treated for a TBI does not guarantee that formal educational identification and services will follow, failing to do so dramatically decreases the likelihood that services will be provided or tailored to the student's specific TBI needs (Glang et al., 2008). Additionally, deficits secondary to TBI may not present themselves immediately and may overlap with other conditions; thus students with TBI are at risk for misidentification under some disability other than brain injury (e.g. Attention Deficit Disorder, Significantly Identifiable Emotional Disorder, Significant Learning Disorder). Often families and school personnel lack awareness that an earlier injury could have resulted in a TBI (Dettmer et al., 2007; Glang et al., 2008; Hibbard, Gordon, Martin, Raskin, & Brown, 2001; Taylor et al., 2002). Furthermore, while we might believe that educators are more knowledgeable than the general public regarding TBI, in fact many teachers leave their university training programs claiming that they had little to no experience or training in childhood TBI (Glang, Todis, Sublette, Brown, & Vaccaro, 2010; Glang et al., 2008; Hooper, 2006). For instance, one study by Glang, Dise-Lewis, & Tyler (2006), revealed that 85-92% of educators reported having no training in TBI.

According to a recent study, general education teachers believe that they lack the knowledge or skills to notice and refer these students for evaluation of IEP eligibility, much less for IEP categorization of TBI (Schutz, Rivers, McNamara, Shutz, & Lobato, 2010). This lack of knowledge regarding TBI likely impacts educators' preparedness to recognize possible TBI in students, and/or their ability to intervene and increase such struggling students' success in school. Parents' misconceptions and lack of previous experience regarding special education (SPED) also present a barrier to identifying children with TBI in schools (Glang et al., 2004; Lash & DePompei, 2002; Savage et al., 2005). Finally, many students with TBI may have little insight into their own disability and demonstrate difficulties with self-advocacy (Gordon, Haddard, Brown, Hibbard, & Sliwinski, 2000; Gronwall et al., 1999). Unfortunately, as Gordon et al. (1998) found, decreased awareness by students of their injury can result in self-blame for academic failings and additional psychological burden, thus leading to compounded student academic failure.

Further complicating identification of children with TBI in schools is that, even though there is a federal definition for TBI in IDEA—"an acquired injury to the brain caused by an external physical force, resulting in total or partial functional disability or psychosocial impairment, or both, that adversely affects a child's education performance" (IDEA, 2004) — states differ in their individual definitions, and more concerning, in their specific eligibility criteria. Currently, most states identify students through medical documentation of a student hospitalization or some other means of medical intervention, though a few states also allow for identification by means of a significant history of TBI, as reported by some credible source (Dettmer et al., 2007). In both cases, the child must display educational impact that most probably and plausibly is related to the TBI (Dettmer et al., 2007). Unfortunately, the nation's

school districts lack protocols and tools that are specific to TBI, for screening and evaluating students; currently most school districts use qualitative assessments along with typical assessment tools that the district has adopted (Dettmer et al., 2007). While the information gained from these assessments may be helpful in planning education interventions and goals for students with TBI, they are not designed for students with TBI specifically, and therefore do not provide the depth of insight of TBI focused tools.

Currently in the research literature, there are several tools for identifying TBI, but few target children—especially in the school setting (U.S. Department of Health and Human Services, 2006). The few notable tools that are specific to TBI in children either lack strong psychometric support or lack clinical utility in schools. For instance, the Brain Injury Screening Questionnaire (BISQ) was developed at the Mount Sinai School of Medicine at the Research and Training Center on Community Integration of Individuals with Traumatic Brain Injury in 1997. The tool contains 100 questions about events that may have resulted in brain injury, as well as functional difficulties and symptoms that may result from brain injury (Cantor et al., 2004). However, while the tool is thorough and has demonstrated utility in identifying children with a high probably of TBI, there are no published research reports that cover the validity and reliability of the BISQ. Additionally, it must be purchased, requires specialized training, and the completed forms must be sent to the Mount Sinai School of Medicine for scoring; making it complicated and possibly expensive for school personnel to use (Cantor et al., 2004; Dettmer et al., 2013). The Columbus Public Schools Brain Injury Screen is another available tool, but currently there appears to be no research that reports specifically on the psychometric properties of the tool (U.S. Department of Health and Human Services, 2006). Additionally, there is the Brain Injury Alert, which screens for cognitive, emotional, and social problems after pediatric

TBI (Rasquin et al., 2011). While the Brain Injury Alert has shown reasonable internal consistency, inter-rater reliability and test-retest reliability, it is designed to provide a qualitative picture of the problems that a child is experiencing as a result of a TBI (Rasquin et al., 2011). Furthermore, it has not been tested for sensitivty or specificty and the authors note that it would likely be weak in differentiating between TBI and other disorders that result in cognitive, emotional, and social difficulties (Rasquin et al., 2011). Likewise, the Ohio State University TBI Identification Method uses structured interview to elicit a history of TBI, but lacks psychometric support on the tool's sensitivity and specificity to disinguish TBI from disabilities with similar symptom profiles (Corrigan & Bogner, 2007; Dettmer et al., 2013).

Each of these tools possesses weaknesses, either in their psychometic properties or in the construct they measure, and thus, there continues to be a need for screening tools that can be used in schools to identify children who quite probably have experienced a TBI and are struggling in their studies, as a result of it. Screening for TBI, in particular, is an important initiative, because it is the first step in coordinating appropriate resources and services; early identification and intervention are keys to timely transition planning and successful long-term student outcomes (U.S. Department of Health and Human Services, 2006).

Given the continuing need for a screening tool that has strong psychometric properties, as well as ease of administration, researchers in the Life Outcomes after Brain Injury research program in the Occupational Therapy Department at Colorado State University developed the Brain Check Survey (BCS). The BCS tool is a parent-report questionnaire intended for use by schools as a starting point in the process of qualifying students for Special Education, a 504 Plan, or Response to Intervention assistance. At this point in time, the state of Colorado has placed the BCS as the 1st tool in the identification protocol to assist schools in assessing students for TBI,

for educational purposes. Prior to this current study, the tool had been used qualitatively to indicate severity of symptoms and behaviors consistent with TBI, as well as possible contributing events. Sensitivity and specificity analysis, however, had not occurred, and accordingly, the BCS lacked a specific cut-off criterion to quantitatively indicate a positive indication of a suspected history of TBI. Thus, this study sought to explore the specificity and sensitivity of the Brain Check Survey and establish a cutoff point to screen students "in" (positively) or "out" (negatively), related to a suspected history of TBI.

Methods

Design

This study was designed to determine the sensitivity and specificity of the BCS using parametric receiver operator characteristic (ROC) curves, which provide a comprehensive picture of a test's ability to discriminate between the items being examined across all decision thresholds (here possible TBI or not). Tests do not have only one sensitivity and specificity, but rather many; therefore, reporting only one value for sensitivity and specificity may be misleading. Instead, the ROC curve allows us to graphically represent the trade-offs in a test's sensitivity and specificity across a decision threshold. For this study, methodology described by Zweig & Campbell (1993) and Portney and Watkins (2009) was followed, with consideration for the selection of the particular criteria by balancing accuracy with clinical usefulness.

Participants

The participants for this study consisted of parents of students attending one of five Colorado school districts, including rural, urban, and suburban schools. The data for the current study were derived from previous collected data involving the parents of three groups: (1) students currently receiving special education services for diagnosed traumatic brain injury (TBI group); (2) students currently receiving special education services for diagnosed specific learning disabilities; and (3) students who were considered typically developing and not identified as having an IEP or 504 Plan (TYP group). Only surveys completed by parents in the TBI and TYP groups were used in this study.

The number of students selected for this project was proportional to the size of the district so that there were a larger number of participants recruited from the larger districts and a smaller

number of potential participants recruited from the smaller districts. Stratified-random sampling was used for the typical group from each district to recruit equal numbers of males and females, as well as an equal number of students from each of three school levels (elementary, middle, and high). Whole group convenience sampling was used for the participants with TBI, due to the low incidence of students in schools whose IEP was based on them having a TBI. Once the student names were selected from each school district, the parent(s)/guardian(s) of those students in the TYP and TBI groups became the sampling frame, since the BCS is a parent-report questionnaire. All participant contact in the actual recruitment process was made by mail with the parent(s)/guardian(s) only; no students were contacted for the duration of the study. Participant demographics can be viewed in Table 1; it should be noted that race and ethnicity were optional for participants to report on and thus percentages of the sample do not add up to 100%. Additionally, for the section of the BCS where the student's race was indicated, the "white" and "other" options may both include Hispanic participants.

Table 1. Participant Demographics		
Demographic	**TBI**	**TYP**
N	51	394
Gender		
Males	35	201
Females	16	193
Age*		
Range	5-20	5-18
Mean	12.703	12.652
Standard Deviation	3.944	3.360
Race		
American Indian/ Alaskan Native	n=0, 0%	n=6, 1.5%
Asian	n=0, 0%	n=11, 2.8%
Native Hawaiian/ Pacific Islander	n=0, 0%	n=0, 0%
Black or African American	n=3, 5.9%	n=21, 5.3%
White	n=33, 64.7%	n=285, 72.3%
Other/ No Response	n=15, 29.4%	n=71, 18.0%
Ethnicity		
Hispanic or Latino	n=12, 23.5%	n=74, 18.8%
Non-Hispanic or Latino	n=36, 70.6%	n=281, 71.3%
Other/No Response	n=3, 5.9%	n=39, 9.9%

*Age in table represents the child's age at the time of survey completion and is indicated in years

Instrument

Among children with TBI, parents and families often are in the best position to evaluate their child's overall functioning (Dettmer et al., 2007). Under this notion the Brain Check Survey was designed as a parent-report screening tool that assesses students' history of any injuries or illnesses that could possibly have resulted in a brain injury, behaviors and cognitive processes that the child currently shows that may affect learning, and uniquely TBI-related symptoms that the child currently displays. The BCS, formally known as the Screening Tool for Identification of Acquired Brain Injury in School-Aged Children (Dettmer et al., 2007), was developed via consultation with experts in the field of pediatric TBI, as well as through exploration of TBI-related research. The form of the BCS used to collect the data analyzed in this study was

organized into two primary topic areas observed in the child (behaviors and symptoms), which subsequently have been divided further into four factors via factor analysis (*Behavioral Control, Cognitive Procesings, Symptoms- Sensory, and Symptoms- Motor/Output*) (Sample et al., in submission). Table 2 summarizes the items contained under each of the topics/factors of the questionnaire, and the entire Brain Check Survey can be viewed in Appendix A. Each item of the BCS is rated by the parent using a Likert scale ranging from 1 (no problem) to 6 (extreme problem). The BCS also requests information on educational services the child is currently receiving (i.e. occupational therapy, physical therapy, speech language therapy, or other), and difficulties and strengths the child has in school. An earlier pilot study of the instrument was found to have high content validity through the work of an expert panel, as mentioned above (Dettmer et al., 2007). The instrument was revised substantially and re-named the Brain Check Survey, prior to its use in the study that resulted in the data set analyzed in this current study. Subsequent research on the BCS has demonstrated high test-retest reliability, internal consistency, and construct validity (Pickle, 2013; and Sample et al., submitted). The data collected from the larger study of reliability and validity of the revised BCS research project were used for this receiver operator characteristics (ROC) curves analysis, as we sought to establish the specificity and sensitivity of the Brain Check Survey, as well as a cutoff point to indicate a suspected history of TBI.

Table 2. Screening tool questions included in the three primary BCS topic areas

Behavioral control	***Cognitive processing***	***Symptoms***
- Coping with change or transition - Maintaining family and friend relationships - Letting go of one activity to attend to another - Reaction to simple problems - Waiting for his or her turn in a game - Learns from past mistakes or behavior - Thinks before speaking or acting - Listens without interrupting others often - Handles a change in plans - Demonstrates good judgment	- Focusing and maintaining attention - Getting started on activities, tasks, chores, homework and the like on his or her own - Monitoring own progress on homework, assignment, chores, and the like - Solving everyday problems - Learns new things easily - Remembers lists - Remembers day-to-day events	***Sensory*** - Headaches and/or migraines - Blank staring/day dreaming - Dizziness - Change in vision - Fatigue - Light sensitivity ***Motor/ Output*** - Loss of muscle coordination - Blackouts/fainting - Confusion - Seizures - Slurred speech - Has trouble finding the "right" word when talking
For each item above, circle a number or check N/A *No problem* *Extreme Problem* 1 2 3 4 5 6 [ ] N/A		

Data Analysis

Data from the TBI and TYP groups, organized by the four factors mentioned above, were used in creating parametric receiver operator characteristics (ROC) curves. ROC curves diagram the relationship between the capacity of the BCS instrument to discern TBI when present (true positives or sensitivity) and the risk of falsely identifying TBI (false positives or 1 – specificity) (Portney & Watkins, 2009). Data analysis was completed using SPSS version 21. ROC curves were constructed for each of the four factors individually (*Cognitive Processing, Behavioral*

Control, Symptoms- Sensory, and Symptoms- Motor/Output) and of the combined total of the four factors.

The area under the curve (AUC) refers to the ability of a test to make a definitive discrimination between two variables (Zweig, 1993). In this case, the determined cutoff score in the BCS will discriminate between positive or non-positive likelihood of TBI; essentially, that a randomly selected individual from the TBI group has a BCS value larger than that of a randomly chosen individual from the typical group. The perfect discriminatory instrument would have an AUC of 1.0—a true positive rate (sensitivity) of 1.0 and a false positive rate (1- specificity) of zero.

Results

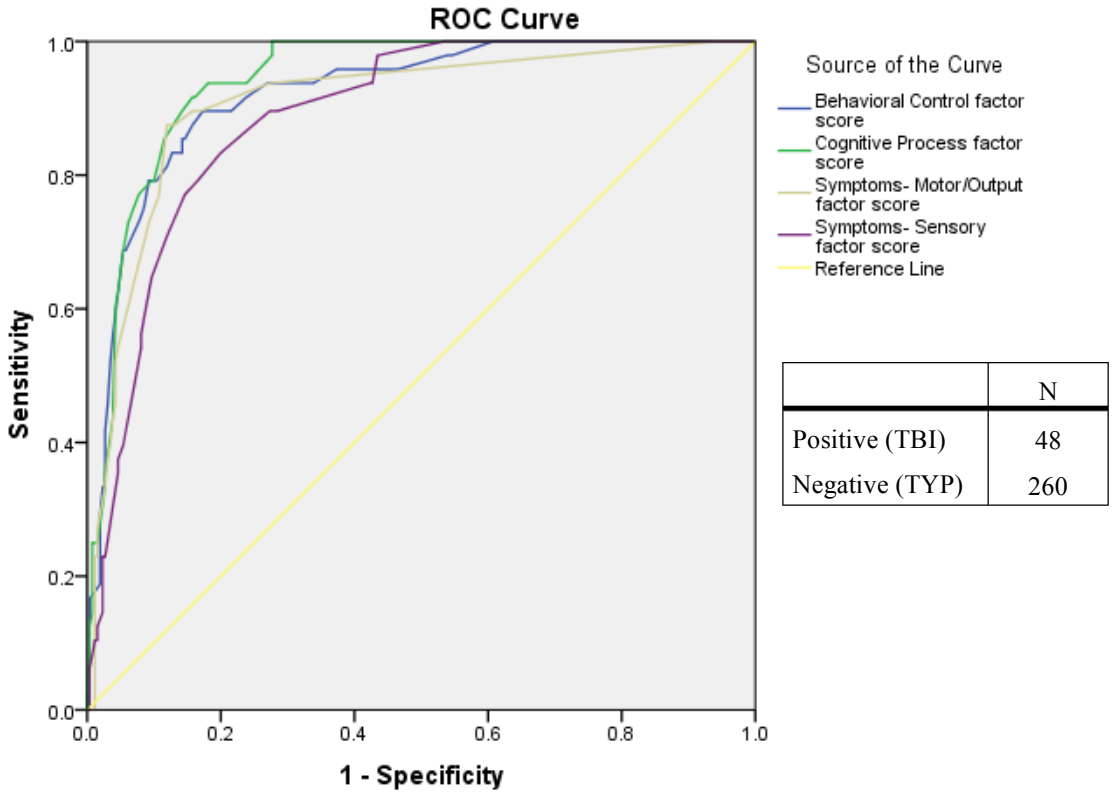
Sensitivity and Specificity

For the factor curves constructed (see Table 3), the AUC was greatest when the means of each of the four factors were totaled (AUC= 0.964), and therefore subsequent ROC curve analysis of sensitivity, specificity, and cutoff criterion were determined from this curve.

Table 3: Results of ROC Curves.

Factor(s)	AUC	Standard error	Asymptotic 95% Confidence Interval	
			Lower bound	Upper bound
Cognitive Processing	.941	.014	.914	.967
Behavioral Control	.921	.020	.882	.960
Symptoms- Sensory	.888	.021	.846	.930
Symptoms- Motor/Output	.908	.024	.861	.956
Sum of all factors	.964	.008	.948	.981

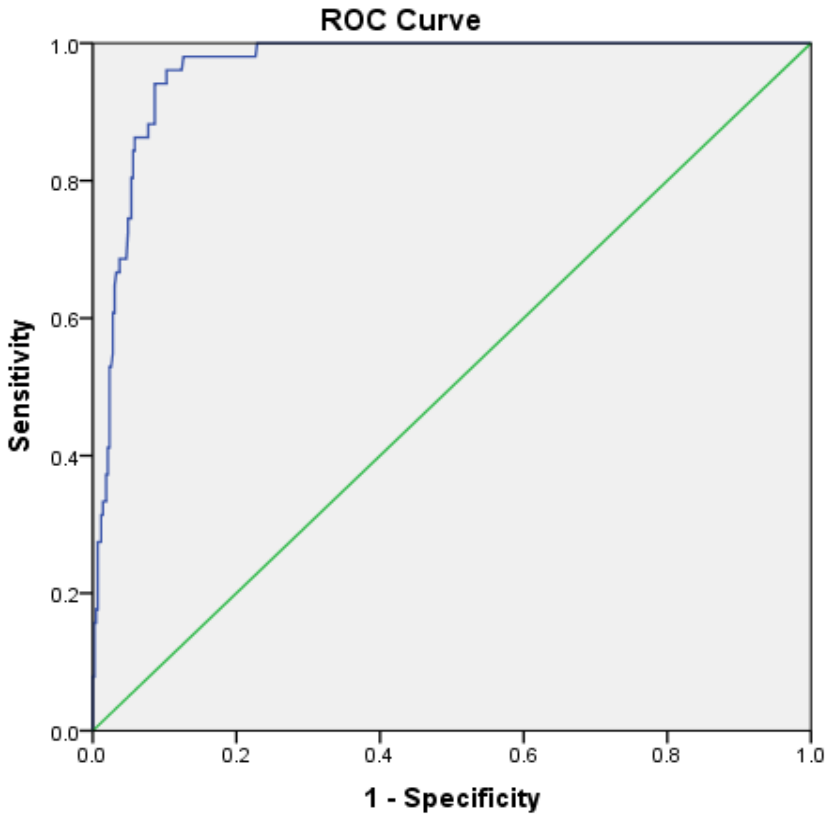
Results of all the individual ROC curve analyses are depicted in Figure 1, with only the ROC curve of the sum of all factors depicted in Figure 2. The total number of surveys used to construct the individual factor curves was 308, while the number of surveys used to construct the curve of sum of all factors was 479; discrepancy results from missing data which is more likely in the case of an individual factor than a total score. The area under the curve (AUC), or likelihood of correct screening of possible TBI, for the sum of all four factors was found to be 0.964. The sensitivity (proportion of actual positives correctly identified as such) and specificity (proportion of negatives correctly identified as such) of the BCS were determined by including data from the 29 items comprising the four factors (*Cognitive Processing, Behavioral Control, Symptoms- Sensory, and Symptoms- Motor/Output*). While a specific decision threshold must be



	N
Positive (TBI)	48
Negative (TYP)	260

Figure 1: Receiver operator characteristic (ROC) curve of each factor.

chosen for the BCS to be useful in the brain injury screening process, the ROC curve illustrates the Brain Check Survey's ability to discriminate across all thresholds.



	N
Positive (TBI)	51
Negative (TYP)	428

Figure 2: Receiver operator characteristics (ROC) curve for the sum of all BCS factors.

The receiver-operating characteristic (ROC) curve was used to determine a threshold value to trigger further TBI-focused assessment. The relative cost of false positives, or over-identifying children for further TBI assessment, was determined minimal to the cost of under-identifying children, who may quite possibly have a TBI. Thus, in order to increase sensitivity without compromising specificity, a raw total cut off value of eight (8) was chosen (Zweig, 1993) (see Table 4). As a screening tool, the BCS acts as the first step in the process of identification; therefore while the tool demonstrates greater sensitivity than specificity at a score of 8, it was selected with the assumption that later assessments would detect and screen out those who the BCS had falsely captured. A cutoff score of 8 is consistent with Portney & Watkins' (2009, p.639) recommendation that, "generally the best cutoff point occurs where the [ROC]

curve turns." In addition, analysis of each group found the mean total factor score to be 5.327 for the typical group, 12.719 for the TBI group (see Table 5), and generation of frequencies and the normal curve for each group (Typical and TBI) demonstrates that at a cut-off of 8 the majority of TBI positive students would be selected (see Figure 3). At the value of 8 the sensitivity is found to be 0.961 and the specificity 0.897 (see Table 4). These values also represent the highest sum total of sensitivity and specificity, that is, where each variable is closest to the ideal value of 1 without compromising the other. Therefore, the BCS is specific in that a score equal to or greater than 8 will indicate a suspected TBI, need for further assessment, and possible educational identification of TBI; while a score less than 8 will indicate probable lack of TBI.

Table 4: Specificity and sensitivity for BCS.

BCS Score	Coordinates of the ROC Curve		Specificity	% True Positives	% False Positives	True Positives (n)	False Positives (n)
	True Positives (Sensitivity)	False Positive (1 – Specificity)					
7.85	.961	.114	.886	96.1	11.4	48	6
7.87	.961	.112	.888	96.1	11.2	48	6
7.89	.961	.110	.890	96.1	11	48	5
7.93	.961	.107	.893	96.1	10.7	48	5
7.98	.961	.105	.895	96.1	10.5	48	5
8	.961	.103	.897	96.1	10.3	48	5
8.04	.941	.103	.897	94.1	10.3	47	5
8.07	.941	.100	.900	94.1	10	47	5
8.09	.941	.098	.902	94.1	9.8	47	5
8.11	.941	.096	.904	94.1	9.6	47	5
8.15	.941	.093	.907	94.1	9.3	47	5

*n: Percentages calculated based on fictitious group of 100 students: 50 TBI, 50 TYP

Table 5: Descriptive statistics for typical and TBI groups

Factor		Min.	Max.	Mean	Std. Deviation
Behavioral Control	TBI	1.30	5.80	3.6116	1.01054
	Typical	0.50	5.50	1.6570	.76185
Cognitive Process	TBI	2.14	5.67	4.1318	.92923
	Typical	0.50	5.43	1.7827	.88688
Symptoms- Sensory	TBI	1.17	5.17	2.6635	1.01279
	Typical	0.50	5.67	1.5033	.77666
Symptoms- Motor/Output	TBI	1.00	4.50	2.5690	1.04653
	Typical	0.50	6.00	1.2108	.64776
Sum of all factors	TBI	6.38	20.47	12.7192	3.08879
	Typical	1.00	17.31	5.3273	2.48861

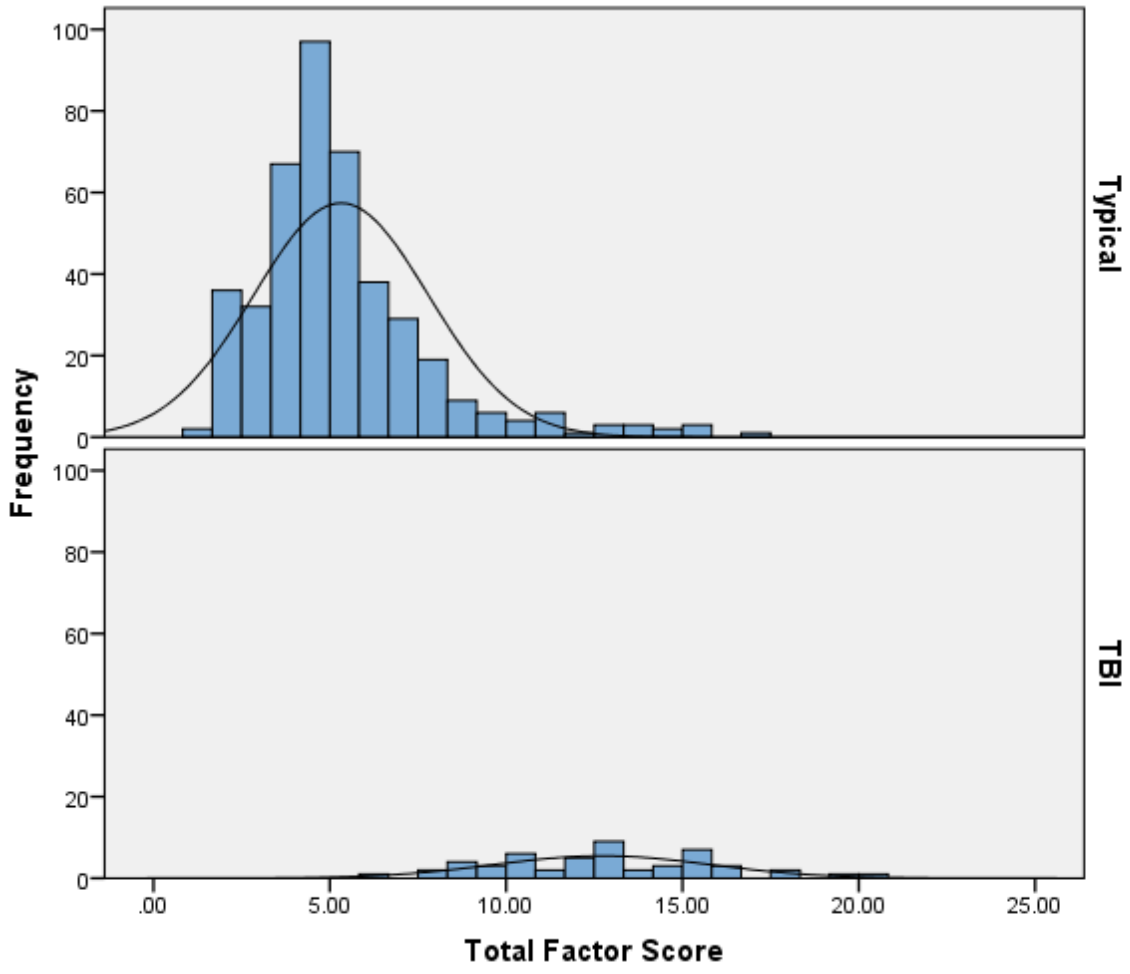


Figure 3: BCS total factor score frequencies and normal for typical (n=428) and TBI (n=51) groups.

Discussion

The purpose of this study was to conduct receiver operator characteristics (ROC) curve analysis of the Brain Check Survey (BCS), which is a critical component for establishing the sensitivity and specificity of the tool. Additionally, the ROC curve analysis allowed for the determination of a cutoff score for suspected TBI, thus supporting the use of the BCS as a screening tool for school students who are struggling educationally—possibly as the result of an undiagnosed TBI.

The ROC curve analysis of the BCS, using the data from typical developing students and students with known TBI, revealed that the BCS demonstrates strong sensitivity and strong specificity in distinguishing between the two groups. Strongest sensitivity and specificity were established through inclusion of all four factors of the BCS including: *Cognitive Processing, Behavioral Control, Symptoms-Sensory, and Symptoms-Motor/Output*, rather than any individual factor alone, thereby affirming the inclusion of all items currently in the BCS. At the determined cutoff value of 8, the tool captures the highest percent of "true positive screens," with a lowest percent of "false positive screens."

There has been an ongoing need for an instrument that objectively screens for the intensity and variety of concerns of students with brain injuries in the areas of cognitive/executive, behavioral, and symptom concerns. Thus far, any tools that have been developed either focused on measuring children with various disabilities, or are more medically-based. The BCS tool now fills this gap and represents an opportunity for schools to begin implementing an educational-identification of TBI process. Additionally, the BCS gathers information on students' history of head/brain injury or illness. A screening tool is only as good

as its clinical utility and usability. The BCS is not only a free tool, but now with a determined cutoff score, may be scored so that most school personnel can screen in students with suspected TBI, and recommend further formal assessments in a school district's process of determining the actual presence of a TBI.

The BCS screening tool is designed for use as part of a comprehensive identification protocol that closely aligns with the current national trend in education to move from an IQ discrepancy or medical model to a Responsiveness To Intervention (RTI) model. The BCS can be used directly in the RTI process. For example, if a child is struggling in school and a TBI is suspected, the BCS can be completed by a parent/guardian, and if a positive identification is made via a ≥8 BCS score, the child can be referred for additional evaluation and standardized assessment. If functional difficulties consistent with a TBI are found, and the student has a history that is "credible" for a possible brain injury incident, a final designation can be made of an "identification of TBI for educational proposes" (Colorado Department of Education-Exceptional Student Services, 2013 Dettmer et al., 2013). With this designation the child/student will be determined eligible for either 504 or special education with an IEP, if needed.

Overall, the BCS and its validation could have a profound effect on the delivery of appropriate interventions for students with TBI nationwide. With this last set of analyses, the BCS screening tool has been fully tested and is ready for wide-spread use throughout the U.S. Revisions to the formatting of the BCS tool have been completed for purposes of ease of administration, so that each section is now reflective of the four factors determined through the factor analysis, and can be viewed in Appendix B. No changes in content, however, have been made from the version used in this study. The adoption of a school-based, no-cost screening tool for TBI, along with the protocol of assessments to use for more specific diagnosis of a TBI for

educational purposes, could replace the expensive, deficit-driven medically-based diagnostic methods currently being used throughout the U.S. As Dettmer et al. (2007) noted, there are thousands of children and adolescents failing in their role as students because no one has questioned if the child has a possible TBI. Once this question is asked, and answered, students can have access to needed services and supports. With the development of simple screening tools, such as the BCS, schools will have data to inform them in providing services that enable students with TBI to be more successful.

Limitations and Recommendations for Future Research

The limitations of this study include a low number of participants with TBI, compared to the typical group. Traumatic brain injury, historically, has a lower incidence rate than the other IEP eligibility groups, as was discussed in the review of literature above, and therefore it was difficult for the researchers to obtain large numbers of participants representing that diagnosis. The exclusion of children with other specific disabilities also poses a limitation; while this study demonstrates that the BCS is sensitive and specific in discriminating between a child with a TBI and a typically developing child, its sensitivity and specificity is unknown when compared to other groups (i.e. autism, emotional disturbance, developmental delay, intellectual disability, specific learning disability etc.). While data were initially requested from parents of children with IEPs based on them having specific learning disability (SLD), in the study of the BCS's validity and reliability, the number of total participants in this group from whom data actually were collected was too low to be compared to that of the TYP and TBI groups, limiting the further exploration of sensitivity and specificity. Additionally, the tool has not been assessed for sensitivity and specificity along the spectrum of TBI and cannot be used to determine TBI severity.

Finally, there are several challenges for researchers and educators to consider in TBI screening in general, with any tool, including the BCS. First, few rigorous studies have examined TBI screening measures for children and future outcomes. Secondly, while a screening instrument identifies potential concerns, it should not be used in isolation to determine the presence of TBI. Screening should be followed by more detailed evaluation to determine the student's functioning in school and if the suspected TBI clearly has resulted in adverse educational impact.

Future research would be strengthened through a larger sample size that includes children with other disabilities as well as children with a variety of TBI severity levels, for comparative analysis, to determine if the BCS is equally as sensitive and specific amongst these groups. Additionally, exploration of the BCS's ability to discriminate across time since suspected occurrence of traumatic brain injury would be beneficial. Finally, use of the BCS and other TBI screening tools should be investigated to provide insight as to whether screening brings about meaningful and measureable positive outcomes for students.

Conclusion

The Brain Check Survey's sensitivity and specificity is confirmed to be strong and well-founded by the results of this study, and subsequently a cutoff criterion has been established. Therefore the BCS is a valuable tool that can be used confidently in school systems for students who may have a TBI. Parent's completion of the BCS provides a starting point for educators and parents to engage in the RTI process and discuss the course of action that will optimize student learning outcomes though better understanding of what may be leading to the child's difficulty performing in school. The Brain Check Survey was designed to be a feasible and no-cost method of screening for TBI, through user-friendly design for parent completion, ease of interpretation

by professionals in the school, and exclusivity in examining children's roles as students. The positive findings of this receiver operator characteristics (ROC) curve analysis demonstrate the strong validity of the Brain Check Survey (BCS), and its effectiveness in screening students for possible TBI.

[1] The Brain Check Survey reliability and validity testing study, from which the data for this research project were collected, was funded by the Colorado Traumatic Brain Injury Trust Fund and approved by Colorado State University's Institutional Review Board. The ethics committees of the five school districts that participated in the study also gave approval.

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Appendix A

Brain Check Survey

Colorado State University

Department of Occupational Therapy
College of Applied Human Sciences
Fort Collins, Colorado 80523-1573
(970) 491-6253
FAX: (970) 491-6290

Brain Check Survey

Parent/Guardian Version

Student Information

Today's Date: ___/___/___ Child's Age: _____

Child's Date of Birth: ___/___/___ Child's Gender: ☐ Male ☐ Female

Child's race: (circle one or more)	1: American Indian/Alaska Native 2: Asian 3: Native Hawaiian or Other Pacific Islander	4: Black or African American 5: White 6: More than one race Please describe:_____
Child's ethnicity: (circle one)	1: Hispanic or Latino 2: Not Hispanic or Latino	3: Unknown or Not Reported

Injuries or Illnesses

Injury or Illness	Age	Outcomes
Please check all that apply		
☐ **Blow to Head** (from sports, playing, biking, falling, getting hit by an object, etc.)	At what age?___	Check all that apply: ☐ Concussion ☐ Loss of consciousness, *for how long?_____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem
☐ **Whiplash**	At what age?___	Check all that apply: ☐ Concussion ☐ Loss of consciousness, *for how long?_____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental stat Missed school ☐ Resulted in no problem

Injury or Illness	Age	Outcomes
Please check all that apply		
☐ **Car accident** (resulting in any degree of injury or lack of injury)	At what age?____	Check all that apply: ☐ Concussion ☐ Loss of consciousness, *for how long?_____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem
☐ **Assault/Violence (child abuse, fights, firearm injury)**	At what age?____	Check all that apply: ☐ Concussion ☐ Loss of consciousness, *for how long?_____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem
☐ **Sustained High Fever**	At what age?____	Check all that apply: ☐ Loss of consciousness, *for how long?_____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem
☐ **Brain Tumor**	At what age?____	Check all that apply: ☐ Loss of consciousness, *for how long?_____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem
☐ **Anoxia** (definition: lack of oxygen; caused by such events as a near-drowning experience or suffocating experience)	At what age?____	Check all that apply: ☐ Loss of consciousness, *for how long?_____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem

Injury or Illness	Age	Outcomes
Please check all that apply		
☐ **Meningitis**	At what age?____	Check all that apply: ☐ Loss of consciousness, *for how long?_____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem
☐ **Encephalitis**	At what age?____	Check all that apply: ☐Loss of consciousness, *for how long?_____ ☐Coma, *for how long? _____ ☐Confusion or altered mental state ☐Missed school ☐ Resulted in no problem
☐ **Seizures** (example: epilepsy)	At what age?____	Check all that apply: ☐ Loss of consciousness, *for how long?_____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem
☐ **Overdose of** drugs or alcohol, or inappropriate use of prescription drugs or over- the-counter medication?	At what age?____	Check all that apply: ☐ Loss of consciousness, *for how long?_____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem
☐ **Other: _____** _____	At what age?____	Check all that apply: ☐ Concussion, *for how long? _____ ☐ Loss of consciousness, *for how long?_____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem

Injury or Illness	Age	Outcomes
Please check all that apply		
☐ **Other:** _____ _____	At what age?___	Check all that apply: ☐ Concussion, *for how long? _____ ☐ Loss of consciousness, *for how long?_____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem

Has your child ever been to the emergency department? ☐ *Yes* ☐ *No*
If YES, at what age?_____ Please explain:

Behaviors that can affect learning

Please tell us about your child's learning styles and behaviors

Learning Style or Behavior	Not Applicable? (check)	Circle the number on the scale which best describes your child: No Problem ⟺ Extreme Problem					
	☐ N/A	**1**	**2**	**3**	**4**	**5**	**6**
Focusing and maintaining attention	☐ N/A	1	2	3	4	5	6
Getting started on activities, tasks, chores, homework and the like, on his or her own	☐ N/A	1	2	3	4	5	6
Being understood (speech is easy to understand, speaks clearly)	☐ N/A	1	2	3	4	5	6
Understanding others	☐ N/A	1	2	3	4	5	6
Coping with change or transitions	☐ N/A	1	2	3	4	5	6
Maintaining family and friend relationships	☐ N/A	1	2	3	4	5	6
Letting go of one activity to attend to another	☐ N/A	1	2	3	4	5	6
Reaction to simple problems	☐ N/A	1	2	3	4	5	6
Monitoring own progress on homework, assignments, chores, and the like	☐ N/A	1	2	3	4	5	6
Solving everyday problems (example: thinking of different options when something is not working for him/her.)	☐ N/A	1	2	3	4	5	6
Waiting for his or her turn in a game	☐ N/A	1	2	3	4	5	6

Learns from past mistakes or behavior	☐ N/A	1	2	3	4	5	6
Thinks before speaking or acting	☐ N/A	1	2	3	4	5	6
Listens without interrupting others often	☐ N/A	1	2	3	4	5	6
Handles a change in plans	☐ N/A	1	2	3	4	5	6
Demonstrates good judgment	☐ N/A	1	2	3	4	5	6
Learns new things easily	☐ N/A	1	2	3	4	5	6
Remembers lists	☐ N/A	1	2	3	4	5	6
Remembers day-to-day events	☐ N/A	1	2	3	4	5	6

Symptoms

If your child has experienced any of the following symptoms, rank the severity of those symptoms.
Please check all that apply:

Symptom	**Not Applicable? (check)**	**Circle the number on the scale which best describes your child:** No Problem ⟺ Extreme Problem					
	☐ N/A	**1**	**2**	**3**	**4**	**5**	**6**
Headaches and/or Migraines (sudden, not responsive to medications, can last for more than a day)	☐ N/A	1	2	3	4	5	6
Loss of muscle coordination (can look like awkward movements, problems with balance, slowed reactions, uncoordinated running and catching)	☐ N/A	1	2	3	4	5	6
Blackouts/ Fainting	☐ N/A	1	2	3	4	5	6
Confusion	☐ N/A	1	2	3	4	5	6
Blank staring/Day dreaming	☐ N/A	1	2	3	4	5	6
Dizziness	☐ N/A	1	2	3	4	5	6
Change in vision (blurred vision, double vision, depth perception)	☐ N/A	1	2	3	4	5	6
Fatigue (tires easily, is often tired)	☐ N/A	1	2	3	4	5	6
Seizures	☐ N/A	1	2	3	4	5	6
Slurred speech	☐ N/A	1	2	3	4	5	6
Has trouble finding the “right” word when talking	☐ N/A	1	2	3	4	5	6
Noise sensitivity (can be easily upset by loud noises or specific sounds like a ticking clock.)	☐ N/A	1	2	3	4	5	6
Light sensitivity (can be easily upset by bright or strobe lights)	☐ N/A	1	2	3	4	5	6

Sleepiness (has trouble staying awake during the day)	☐ N/A	1	2	3	4	5	6
Mood swings (unusual and/or quick changes between sadness, happiness, depression, anxiety, anger and the like; irritability)	☐ N/A	1	2	3	4	5	6

Educational Services

*Is your child having difficulties with school performance? Please describe:*_____

*What does your child do best at in school? Please describe:*_____

Is your child currently receiving any of the following services?
Check all that apply (If "yes", please check if they are provided through school and/or being provided privately).

Service	***Child's Status (please check)***
Occupational therapy	☐ **No** ☐ **Yes** If Yes, please check whether these services are delivered by: ☐ *school-supported specialists* (the school pays for the specialist); and/or ☐ *by private specialists* (you and/or your insurance pays)
Physical therapy	☐ **No** ☐ **Yes** If Yes, please check whether these services are delivered by: ☐ *school-supported specialists* (the school pays for the specialist); and/or ☐ *by private specialists* (you and/or your insurance pays)
Speech-Language therapy	☐ **No** ☐ **Yes** If Yes, please check whether these services are delivered by: ☐ *school-supported specialists* (the school pays for the specialist); and/or ☐ *by private specialists* (you and/or your insurance pays)
Other: _____	☐ **No** ☐ **Yes** If Yes, please check whether these services are delivered by: ☐ *school-supported specialists* (the school pays for the specialist); and/or ☐ *by private specialists* (you and/or your insurance pays)

Has your child ever been evaluated for special education services? ☐ YES ☐ NO
If Yes, at what age was your child first evaluated? _____

Does your child have a 504 plan? ☐ YES ☐ NO
If Yes, are the accommodations helping your child's school performance?
☐ YES ☐ NO

Does your child have an IEP, Individualized Education Plan?

☐ **No**

☐ **Yes** → if YES, please answer 1 & 2 immediately below:

1. Is the IEP helping your child's school performance?
   ☐ YES ☐ NO
2. Please check all categories listed on the IEP:
   - ☐ Autism
   - ☐ Hearing Disability
   - ☐ Multiple Disabilities
   - ☐ Physical Disability - Conditions such as, but not limited to, attention deficit disorder, attention deficit hyperactivity disorder, and cerebral palsy may qualify as a physical disability
   - ☐ Pre-School Child with a Disability
   - ☐ Significant Identifiable Emotional Disability (SIED)
   - ☐ Specific Learning Disability (SLD)
   - ☐ Speech-Language Impairment
   - ☐ Significant Limited Intellectual Capacity (SLIC)
   - ☐ Traumatic Brain Injury (TBI)
   - ☐ Vision Disability
   - ☐ Other_____

Family Information

*Please answer the following questions about **YOURSELF***

Are you the student's (circle all that apply):

☐ Mother ☐ Father ☐ Foster Parent

☐ Other (ex: stepmother) please describe:_____

Your Age: _____ **Date of Birth**: ___/___/___

Your race: (circle one or more)	1: American Indian/Alaska Native 2: Asian 3: Native Hawaiian or Other Pacific Islander	4: Black or African American 5: White 6: More than one race Please describe:_____
Your ethnicity: (circle one)	1: Hispanic or Latino 2: Not Hispanic or Latino	3: Unknown or Choose not to Report

What is your highest level of education? (Check one.) This question is optional.

☐ Some high school
☐ High school graduate
☐ Some college
☐ College graduate (Associate's Degree)
☐ College graduate (Bachelor's Degree)
☐ Some graduate training
☐ Master's Degree
☐ Doctorate or professional degree (lawyer, PhD., M.D., etc.)

Family Gross Income (Before taxes-- check one.) This question is optional.
Note: If parents are divorced and child lives in both families, then record the income of both households separately.

1. less than $5,000
2. $5,000 to $10,000
3. $10,001 to $15,000
4. $15,001 to $20,000
5. $20,001 to $25,000
6. $25,001 to $30,000
7. $30,001 to $35,000
8. $35,001 to $40,000
9. $40,001 to $45,000
10. $45,001 to $50,000
11. $50,001 to $60,000
12. $60,001 to $70,000
13. $70,001 to $80,000
14. $80,001 to $90,000
15. $90,001 to $100,000
16. $100,001 to $150,000
17. $150,001 to $200,000
18. $200,001 to $250,000
19. $250,001 to $300,000
20. More than $300,000

Thank you very much for your time!

Appendix B

Revisions to the Brain Check Survey

Brain Check Survey

Colorado State University
Department of Occupational Therapy
Life Outcomes after Brain Injury (LOBI) Research Program

To be filled out by the parent/guardian

Student/ Family Information

Today's Date: ___/___/___ Child's Name: _____ Child's Age: _____
Child's Date of Birth: ___/___/___ Child's Gender: ☐ Male ☐ Female

*Please answer the following questions about **YOURSELF:***
Are you the student's (circle all that apply)?

☐ Mother ☐ Father ☐ Foster Parent

☐ Other (ex: stepmother) please describe:_____

Your Name (printed): _____ Your Signature: _____

Contact information: Email _____ Phone _____

Injuries or Illnesses

Injury or Illness	Age	Outcomes
Please check all that apply		
☐ **Blow to Head** (From sports, playing, biking, falling, getting hit by an object, etc.)	At what age? ___	*Check all that apply:* ☐ Concussion ☐ Loss of consciousness, *for how long? _____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem
☐ **Whiplash**	At what age? ___	*Check all that apply:* ☐ Concussion ☐ Loss of consciousness, *for how long?_____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem

Injury or Illness	Age	Outcomes
Please check all that apply		
☐ **Car accident** (resulting in any degree of injury or lack of injury)	At what age? ____	*Check all that apply*: ☐ Concussion ☐ Loss of consciousness, *for how long? _____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem
☐ **Assault/ Violence (child abuse, fights, firearm injury)**	At what age? ____	*Check all that apply:* ☐ Concussion ☐ Loss of consciousness, *for how long? _____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem
☐ **Sustained High Fever**	At what age? ____	*Check all that apply:* ☐ Loss of consciousness, *for how long? _____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem
☐ **Brain Tumor**	At what age? ____	*Check all that apply:* ☐ Loss of consciousness, *for how long? _____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem
☐ **Anoxia** (definition: lack of oxygen; caused by such events as a near-drowning experience or suffocating experience)	At what age? ____	*Check all that apply:* ☐ Loss of consciousness, *for how long? _____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem

Injury or Illness	Age	Outcomes
Please check all that apply		
☐ **Meningitis**	At what age? ____	*Check all that apply:* ☐ Loss of consciousness, *for how long? _____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem
☐ **Encephalitis**	At what age? ____	*Check all that apply*: ☐Loss of consciousness, *for how long? _____ ☐Coma, *for how long? _____ ☐Confusion or altered mental state ☐Missed school ☐ Resulted in no problem
☐ **Seizures** (example: epilepsy)	At what age? ____	*Check all that apply:* ☐ Loss of consciousness, *for how long? _____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem
☐ **Overdose of** Drugs or alcohol, or inappropriate use of prescription drugs or over- the-counter medication?	At what age? ____	*Check all that apply*: ☐ Loss of consciousness, *for how long? _____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem
☐ **Other:** _____ _____	At what age? ____	*Check all that apply*: ☐ Concussion, *for how long? _____ ☐ Loss of consciousness, *for how long? _____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem

Injury or Illness	Age	Outcomes
Please check all that apply		
☐ **Other:** _____ _____	At what age? ____	*Check all that apply:* ☐ Concussion, *for how long? _____ ☐ Loss of consciousness, *for how long? _____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem

Has your child ever been to the emergency department? ☐ *Yes* ☐ *No*
If YES, at what age?_____ Please explain:

Behaviors that can affect learning

Please tell us about your child's learning styles and behaviors

Learning Style or Behavior	**Circle the number on the scale which best describes your child:** **No Problem ⟺ Extreme Problem**					
1. Coping with change or transitions	1	2	3	4	5	6
2. Maintaining family and friend relationships	1	2	3	4	5	6
3. Letting go of one activity to attend to another	1	2	3	4	5	6
4. Reaction to simple problems	1	2	3	4	5	6
5. Waiting for his or her turn in a game	1	2	3	4	5	6
6. Learns from past mistakes or behavior	1	2	3	4	5	6
7. Thinks before speaking or acting	1	2	3	4	5	6
8. Listens without interrupting others often	1	2	3	4	5	6
9. Handles a change in plans	1	2	3	4	5	6
10. Demonstrates good judgment	1	2	3	4	5	6

Cognitive processes that can affect learning

Please tell us about your child's learning styles

Learning Style or Cognitive Processes	**Circle the number on the scale which best describes your child:** **No Problem ⟺ Extreme Problem**					
1. Focusing and maintaining attention	1	2	3	4	5	6
2. Getting started on activities, tasks, chores, homework and the like, on his or her own	1	2	3	4	5	6
3. Monitoring own progress on homework, assignments, chores, and the like	1	2	3	4	5	6
4. Solving everyday problems (example: thinking of different options when something is not working for him/her.)	1	2	3	4	5	6
5. Learns new things easily	1	2	3	4	5	6
6. Remembers lists	1	2	3	4	5	6
7. Remembers day-to-day events	1	2	3	4	5	6

Symptoms- Part 1

If your child has experienced any of the following symptoms, rank the severity of those symptoms.

Symptom	**Circle the number on the scale which best describes your child:** **No Problem** ⟺ **Extreme Problem**					
1. Headaches and/or Migraines (sudden, not responsive to medications, can last for more than a day)	1	2	3	4	5	6
2. Blank staring/Day dreaming	1	2	3	4	5	6
3. Dizziness	1	2	3	4	5	6
4. Change in vision (blurred vision, double vision, depth perception)	1	2	3	4	5	6
5. Fatigue (tires easily, is often tired)	1	2	3	4	5	6
6. Light sensitivity (can be easily upset by bright or strobe lights)	1	2	3	4	5	6

Symptoms- Part 2

If your child has experienced any of the following symptoms, rank the severity of those symptoms

Symptom	**Circle the number on the scale which best describes your child:** **No Problem** ⟺ **Extreme Problem**					
1. Loss of muscle coordination (can look like awkward movements, problems with balance, slowed reactions, uncoordinated running and catching)	1	2	3	4	5	6
2. Blackouts/ Fainting	1	2	3	4	5	6
3. Confusion	1	2	3	4	5	6
4. Seizures	1	2	3	4	5	6
5. Slurred speech	1	2	3	4	5	6
6. Has trouble finding the “right” word when talking	1	2	3	4	5	6

Educational Services

Is your child having difficulties with school performance? Please describe:

_____

_____

_____

_____

_____

What does your child do best at in school? Please describe:

_____

_____

_____

_____

_____

_____

Is your child currently receiving any of the following services?
Check all that apply (If "yes", please check if they are provided through school and/or being provided privately)

Service	***Child's Status (please check)***	
Occupational therapy	☐ **No**	☐ **Yes** If Yes, please check whether these services are delivered by: ☐ *school-supported specialists* (the school pays for the specialist); and/or ☐ *by private specialists* (you and/or your insurance pays)
Physical therapy	☐ **No**	☐ **Yes** If Yes, please check whether these services are delivered by: ☐ *school-supported specialists* (the school pays for the specialist); and/or ☐ *by private specialists* (you and/or your insurance pays)
Speech-Language therapy	☐ **No**	☐ **Yes** If Yes, please check whether these services are delivered by: ☐ *school-supported specialists* (the school pays for the specialist); and/or ☐ *by private specialists* (you and/or your insurance pays)
Other: _____	☐ **No**	☐ **Yes** If Yes, please check whether these services are delivered by: ☐ *school-supported specialists* (the school pays for the specialist); and/or ☐ *by private specialists* (you and/or your insurance pays)

Has your child ever been evaluated for special education services? ☐ YES ☐ NO

If Yes, at what age was your child first evaluated? _____

Does your child have a 504 plan? ☐ YES ☐ NO

If Yes, are the accommodations helping your child's school performance?
☐ YES ☐ NO

Does your child have an IEP, Individualized Education Plan?

☐ **No**

☐ **Yes** → if YES, please answer 1 & 2 immediately below:

3. Is the IEP helping your child's school performance?
   ☐ YES ☐ NO
4. Please check all categories listed on the IEP:
   - ☐ Autism
   - ☐ Hearing Disability
   - ☐ Multiple Disabilities
   - ☐ Physical Disability - Conditions such as, but not limited to, attention deficit disorder, attention deficit hyperactivity disorder, and cerebral palsy may qualify as a physical disability
   - ☐ Pre-School Child with a Disability
   - ☐ Significant Identifiable Emotional Disability (SIED)
   - ☐ Specific Learning Disability (SLD)
   - ☐ Speech-Language Impairment
   - ☐ Significant Limited Intellectual Capacity (SLIC)
   - ☐ Traumatic Brain Injury (TBI)
   - ☐ Vision Disability
   - ☐ Other_____