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# Speech-Language Pathologists' Knowledge, Confidence Levels, and Practice Patterns with Mild Traumatic Brain Injury in the Schools

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# SPEECH-LANGUAGE PATHOLOGISTS' KNOWLEDGE, CONFIDENCE LEVELS, AND PRACTICE PATTERNS WITH MILD TRAUMATIC BRAIN INJURY IN THE SCHOOLS

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## ABSTRACT

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Speech-language pathologists (SLPs) play a key role in serving children with cognitive-communication disorders in both medical and school settings. However, there remains little evidence regarding school-based SLPs' service delivery for children following concussion or mild traumatic brain injury (mTBI) and how they rate their confidence, knowledge, and skills providing these services. The purpose of this study was to examine knowledge, confidence levels, and practice patterns for providing services to pediatric students with mTBI among school-based SLPs. A 43- item survey was developed to assess current concussion knowledge, and to allow for comparison to previous and future surveys on knowledge, confidence, and management of brain injury across settings and severity. Surveys were distributed electronically to members of American Speech-Language-Hearing Association (ASHA) Special Interest Group 02: Neurogenic Communication Disorders and the Colorado Department of Education SLP listserv and school-based leaders in Florida, Virginia, and Pennsylvania were contacted to disseminate to their SLPs. A total of 185 respondents completed the survey across 13 states: Arizona, California, Colorado, Delaware, Georgia, Idaho, Kansas, Maryland, Michigan, Mississippi, South Carolina, South Dakota, and Texas. Results of the study demonstrated a mix of accurate and inaccurate knowledge. SLPs with more TBI experience reported increased levels of confidence and greater knowledge accuracy, however, overall confidence in providing clinical

services to students with mTBI was low. The current sample was largely unfamiliar with recent changes to Center for Disease Control and Prevention (CDC) recommendations regarding management of mTBI and was less likely to engage in training or continuing education for TBI. Findings of this study suggest that there is a need for increased training and education on service delivery of pediatric mTBI among SLPs and increased advocacy of the SLP's role among brain injury teams to improve prevention, assessment, intervention, and follow-up practices.

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# CHAPTER I

# INTRODUCTION TO THE STUDY

## Background

Traumatic brain injury (TBI), a disruption in the normal function of the brain as a result of a bump or blow to the head or a penetrating head injury, is a common cause of disability and death in the United States (Center for Disease Control and Prevention [CDC], 2021). From 2005 to 2009, children presented for more than 2 million outpatient visits and almost 3 million emergency department visits for mild traumatic brain injury (mTBI) alone (Mannix et al., 2013). Many challenges exist for children with TBI. In addition to recovering to their previous level of functioning, children with TBI must also learn new skills during their recovery to stay developmentally on track (Keenan et al., 2018). Disruptions in neural development as a result of TBI can lead to deficits in cognitive, physical, social, or emotional abilities in children and adolescents (Keenan et al., 2018; Wu et al., 2010). Due to the potentially lifelong cognitive, social, and language challenges associated with TBI in children, speech-language pathologists (SLP) are essential to providing rehabilitative services for children to support academic success and transitions into adulthood. However, a low prevalence of students with TBI on school-based SLP caseloads limits opportunities for clinical experience and may leave SLPs not feeling compelled to obtain additional professional development specific to TBI (Pelatti et al., 2019). At times, children with TBI may go unnoticed as common symptoms of nausea, headache, and fatigue may be confused for a flu virus (Jantz et al., 2014). Although assessment and treatment of pediatric traumatic brain injuries are within the SLP scope of practice (American

Speech-Language-Hearing Association [ASHA], 2016), lack of training and/or clinical experience may influence SLP confidence in service delivery within school settings.

## Significance of the Study

Despite the vital role SLPs have within a TBI team, confidence levels in providing quality care and appropriate services remain an area of exploration. Furthermore, school-based SLPs' knowledge of current standards of care with new mTBI guidelines established by the CDC in 2018 has yet to be evaluated. These mTBI guidelines provide a foundation for interdisciplinary efforts across health care and educational disciplines, however, discussion of specific professionals involved and what their distinct roles are with this population are not provided. Recovery programs such as "Return to Learn," which support a gradual return to activity to ensure optimal recovery in students with pediatric TBI, provide an opportunity for school-based SLPs to educate and raise awareness on pediatric acquired brain injury within the faculty, facility, and public. However, despite these programs, few students with mTBI will qualify for services and therefore may not be added to SLPs' caseloads (Brown et al., 2019). Research has shown that 60% of children with TBI do not receive school-based services due to delayed effects post-injury and a lack of longitudinal monitoring (Todis, 2007). Therefore, it is critical that SLPs advocate for their role in brain injury teams and return-to-learn programs. The purpose of this study was to examine education, knowledge, and confidence levels among school-based SLPs treating students with pediatric TBI, including mTBI. There remains limited evidence in the literature regarding school-based SLPs' perceived knowledge of and confidence in providing services to children with TBI.

# CHAPTER II

# REVIEW OF THE LITERATURE

## Traumatic Brain Injury

Traumatic brain injuries (TBIs) can occur in adults and children of all ages, however, 26% of the 2.5 million emergency room visits related to TBI annually in the United States are for children ages 0-14 years old (C. A. Taylor et al., 2017). For school-aged children ages 5-14 years old, 335,966 individuals accounted for emergency room visits for TBI in 2013 (C. A. Taylor et al., 2017). For adolescents and young adults (ages 15-24), this number increased to 441,187 individuals, with a rate of approximately 1,001 per 100,000 population annually following a mild TBI or concussion (C. A. Taylor et al., 2017). Among adolescents (ages 15-19), the most common cause for TBI is motor vehicle accidents, with a more frequent prevalence in males (Faul et al., 2010). TBI can result in various consequences including neurological, cognitive, behavioral, emotional, social, and academic depending on the severity of the injury. Severity levels include mild, moderate, and severe and are typically measured by the Glasgow Coma Scale (GCS; Teasdale & Jennett, 1974). The GCS is one of the most widely used assessments for severity classification of TBI which evaluates an individual's level of consciousness and neurological functioning (Grafman & Salazar, 2015). Although a Pediatric Glasgow Coma Scale was developed for infants and younger children, the standard version of the Glasgow Coma Scale can be used for children older than 5 years old without modifications (CDC, 2016).

Brain damage due to traumatic brain injury results in both primary (direct) brain injuries and secondary injuries (i.e., short or long-term effects) that can occur within days of the

immediate trauma (El Sayed et al., 2008). Tissue damage and functional impairment due to TBI are attributed to symptoms associated with primary injury and secondary injury (Mckee & Daneshvar, 2015). Primary injury occurs immediately at the time of impact and involves mechanical cell destruction (Mckee & Daneshvar, 2015). El Sayed et al. (2008) found that in a simulated TBI with focal damage through diffuse axonal injury, coup and contrecoup injuries, the primary effects were shear strain, intracranial pressure, and mechanical damage parameters. Stretching and shearing of axonal tracts within the brain tissue result in contusions, cell destruction, and possible hemorrhage (El Sayed et al., 2008). The shearing forces of TBI can cause axonal swelling within the corpus callosum, cerebellum, brainstem, internal capsule, and cerebral white matter in addition to metabolic disturbance and hemorrhage (Mckee & Daneshvar, 2015). This damage has a direct impact on neurons, axons, dendrites, glia, and/or blood vessels which leads to inflammation in addition to metabolic and neurochemical changes (Mckee & Daneshvar, 2015). Secondary brain injury develops within minutes to months after the injury and is mediated by multiple physiological and molecular cascades leading to ongoing neuronal degeneration (Frugier et al., 2010). For young individuals suffering from TBI, this injury also evokes both neuronal and neuroendocrine conditions that are typically associated with trauma (Weil & Karelina, 2019).

## Traumatic Brain Injury and Pediatric Development

An important distinction between TBIs within an adult system versus a pediatric system is that a pediatric TBI causes direct mechanical damage to the *developing* nervous system. This has profound implications for recovery from the trauma in addition to more general nervous system function (Weil & Karelina, 2019). Jonsson et al. (2013) found that emerging skills were more vulnerable to disruption than established skills. In post-natal development, white matter

volume begins increasing within the first year of life in the primary sensory and motor areas of the brain and continues into early adulthood where the prefrontal and temporal regions are the last to fully develop (Gogtay et al., 2004). Throughout adolescence, cognitive capacity increases and neural pathways are strengthened, executive function and memory strategies are refined, and gradual increases in neural processing speed and attentional ability occur (Jonsson et al., 2013). Because of these changes, a disruption in white matter development can impair a child with TBI's ability to acquire new knowledge, leading to greater academic challenges when compared to their peers (Jonsson et al., 2013).

The structural relationship between injury severity and white matter damage leads to disturbances in cognition and processing speed, particularly in pediatric patients as white matter is still developing (Genc et al., 2017). Although white matter continues to grow into adulthood, it is at its greatest speed of growth during adolescence to allow for new pathways and axonal projections to be strengthened (Day et al., 2005). In 3 to 18 months post-injury, longitudinal changes in children and adolescents with mild to moderate-severe TBI have been found in the microstructural integrity of white matter and volume of the corpus callosum and subregions (genu, body, and splenium; Wu et al., 2010). This can lead to slower processing speed and diminished integration of information between hemispheres and can also hinder a child's ability to process complex material (Wu et al., 2010).

## Cognitive and Academic Sequelae of Traumatic Brain Injury

It is estimated that approximately 145,000 children and adolescents aged 0–19 years in the U.S. are living with substantial and long-lasting limitations in social, behavioral, physical, or cognitive functioning following a TBI (Zaloshnja, et al., 2008). However, given the underreporting of mTBI or concussion, and abusive head trauma, these numbers likely

underestimate the true effects of pediatric TBI (Theodore et al., 2005). Several specific academic trends have been identified in students who have experienced a TBI. For example, students with pediatric TBI are vulnerable to direct impacts on learning, particularly in language and reading (Haarauer-Krupa, 2012). In comparison with their typically developing peers, children with TBI have demonstrated difficulty with production of shorter narratives compared to their peers with less ability to provide information and deficits in connecting information across sentences and sequencing verbal information (Chapman et al., 1997; Ewing-Cobbs & Barnes, 2002). Story recall and verbal fluency also may pose a challenge for these students (Anderson et al., 2001). Students with pediatric TBI typically present with a higher risk for difficulty in word reading and decreased language attainment due to deficits in reading comprehension (Haarauer-Krupa, 2012).

Additionally, TBI can lead to impairments in social cognition, with studies finding related deficits in theory of mind, or the ability to understand the emotions, motivations, and thoughts of others (Bibby & McDonald, 2005; Channon et al., 2005; Martin & McDonald, 2003. Children's sensory system and social cognition continue to develop into late adolescence and early adulthood (S. J. Taylor et al., 2013). This can lead to children with TBI suffering from disruption in the development of social, cognitive, or emotional abilities which are essential to functioning at home and school in addition to making and maintaining friends (Keenan et al., 2018). These cognitive sequelae are found to persist in 65% of patients with moderate to severe TBI (National Institutes of Health Consensus Development Panel on Rehabilitation of Persons With Traumatic Brain Injury, 1999).

**Pediatric Mild Traumatic Brain Injury**

Although these deficits are exhibited with higher frequency with increased severity of the injury, pathophysiologic injury and symptoms (both acute and long-term) after mTBI can affect a

child's ability to function physically, cognitively, and psychologically (Dikmen et al., 2010; Hessen & Nestvold, 2009; Lee et al., 2008). Although 70-80% of mTBI symptoms resolve within 3 months in pediatric patients (Babikian et al., 2011; Barlow et al., 2010; Yeates et al., 2009), symptoms during recovery periods can impact activities of daily living including social activities with friends and exercise (Weissman et al., 2019). Additionally, children with mTBI may experience difficulty performing required daily academic tasks (e.g., attending to lectures, note-taking, studying for tests, completing homework; Ransom et al., 2015; Wasserman et al., 2016). These deficits are frequently found persisting for several weeks to months post-concussion in pediatric mTBI (Beaulieu, 2002).

Adolescents recovering from mTBI have been found to experience a wide range of symptoms including physical (e.g., headache, fatigue), neurocognitive (e.g., slowed processing speed, decreased recall and problem solving), and emotional (e.g., sadness, irritability; Breed et al., 2004). High school students must exhibit greater independence and engagement in fast-paced academic activities that require heightened cognitive effort and control than elementary or middle school students. Therefore, these older students can have a decline in grades due to even a temporary neurological change in cognitive performance as a result of mTBI (Ransom et al., 2015).

## Factors Influencing Pediatric Traumatic Brain Injury Outcomes

### Severity of Traumatic Brain Injury

Depending on various factors within pediatric TBI, including age at injury and injury severity, symptoms and long-term consequences can vary within the developing brain. As referenced above, the Glasgow Coma Scale provides a common neurological assessment of the depth and duration of impaired consciousness and coma in individuals with brain injury. Scores

are obtained by assessing three behavioral responses including eye opening response, verbal response, and motor response on a 1-6 Likert scale, giving an individual a score between 3 (indicating deep unconsciousness) and 15 (fully awake; Teasdale & Jennett, 1974). The CDC (2015) classifies mTBI as a loss of consciousness for less than 30 minutes, initial GCS of 13-15 after 30 minutes of injury onset, and post-traumatic amnesia (PTA) not exceeding 24 hours. Concussion, a form of mTBI, occurs as a result of a blow, bump, or jolt to the head, face, neck, or body that may or may not result in loss of consciousness (CDC, 2015). Moderate TBI is defined as loss of consciousness and/or PTA for 1-24 hours and a GCS of 9-12 (CDC, 2015). Severe TBI involves a loss of consciousness for more than 24 hours and PTA for more than 7 days with a GCS of 3-8 (CDC, 2015). Typical associated symptoms based on the level of severity are defined in Table 1. TBI symptoms can vary depending on the severity of the injury and can progress from headaches, fatigue, memory deficits, and sleep disturbance to cognitive and psychosocial dysfunction and emotional distress (Lundin et al., 2006).

**Table 1**

*Traumatic Brain Injury Levels of Severity*

| Severity | Symptoms | | |
|---|---|---|---|
| | Physical | Sensory | Cognitive |
| Mild | -Headache<br>-Nausea or vomiting<br>-Fatigue<br>-Problems with speech<br>-Difficulty sleeping or sleeping more than usual<br>-Dizziness or loss of balance | -Blurred vision<br>-Ringing in ears<br>-Sensitivity to light or sound<br>-Visual disturbances | -Confusion or disorientation<br>-Memory or concentration deficits<br>-Mood changes<br>-Irritability<br>-Feeling depressed or anxious<br>-Fatiguability |
| Moderate | -Persistent headache or headaches that worsens<br>-Repeated vomiting or nausea<br>-Seizures<br>-Inability to awaken from sleep<br>-Sudden swelling or bruising behind ears or around eyes<br>-Weakness or numbness<br>-Loss of coordination or balance<br>-Irregular breathing<br>-Difficulty speaking; slurred speech | -Blurred vision<br>-Loss of vision<br>-Ringing in ears<br>-Sensitivity to light or sound | -Profound confusion<br>-Irritability<br>-Agitation or combativeness or other unusual behavior<br>-Sad or depressed mood<br>-Fatiguability<br>-Difficulty with memory, attention, and judgment |
| Severe | -Results in significant permanent brain damage<br>-May result in total loss of speech ability<br>-Produces lifelong deficits to a severe degree<br>-May require lifetime care and assistance<br>-Sustained loss of consciousness<br>-Can result in death | | |

(Adapted from ASHA, n.d.; CDC, 2021)

## Age at Injury

Recent literature has shown that the plasticity of the developing child's brain is more vulnerable to injury than previously believed (Anderson et al., 2005; Max et al., 2010). It was previously believed that the outcomes of brain injuries in children (ages 3 to 10) and adolescents (ages 10 to 21) were different from those acquired in adulthood (Anderson et al., 2011) in that

those who were younger were thought to able to acquire age-appropriate language, intellect, and academic achievement (Ballantyne et al., 2008; Smith & Sugar, 1975). The more current understanding suggests brain injuries in children and adolescents, when skills are still developing, may influence the mastery and strategy of these skills and rate of development leading to reductions in ultimate levels achieved and the need for compensatory strategies to achieve success in a skill area (Anderson et al., 2011). Depending on the impact during white matter development, age of injury can lead to deficits in cognition and potential changes in behavioral function.

The most commonly occurring cognitive conditions following pediatric TBI are attention deficits, memory impairments, and issues with executive functioning (Brooks et al., 1986; Wilson et al., 2000). Children between the ages of 2 -7 years old at the time of injury are at a higher risk for deficits in attention, expressive language skills, and academic achievement and disabilities such as a developmental delay in comparison with children older than 10 years old with TBI (Anderson et al., 2005; Anderson, Spencer-Smith, et al., 2009; Barnes et al., 1999; Ewing-Cobbs et al., 2004; Verger et al., 2000). Children between the ages of 7 to 9 years old are at a greater risk for significant issues with executive function and behavior (Anderson, Spencer-Smith, et al., 2009). Pragmatic skills are also impacted with a significant correlation found between children who are younger at the time of injury and deficits in social problem solving and information processing (Walz et al., 2009). In children ages 5 to 9 years old, pragmatic deficits found at 6 months post-injury were maintained 2 years later (Ryan et al., 2015). Additionally, preschoolers and school-aged children with TBI have been found to be vulnerable to adverse effects including increased emotional and affective symptoms, issues with conduct, and reduced emotional control (Keenan et al., 2018). Children who are younger at the time of injury have

demonstrated poorer outcomes in areas that contribute to future academic success including behavior regulation, metacognition, and emotional functioning (Keenan et al., 2018). While children who are younger during the time of injury may be more likely to develop anxiety, adolescents or children who are older at the age of injury are at a higher risk for depression (Max et al., 2012).

**Traumatic Brain Injury in the Schools**

It is critical that students with TBI not fall behind to maintain age-appropriate cognitive, linguistic, social, and emotional skills and to ensure readiness to enter into society. Schools are mandated to provide services, including speech-language treatment, to meet a child's learning needs under the Individuals with Disabilities Education Act (IDEA, 2004) or 504 plans (within the Americans with Disabilities Act [ADA], 1990), which establishes the role of SLPs in cognitive rehabilitation within the school program for students with TBI (Haarauer-Krupa, 2012). As determined through state-by-state legislation, school systems may be required to have designated programs to assist students with disabilities related to potential TBI and have professionals including SLPs accessible to evaluate an individual and help develop their plan for returning to school which may include an Individualized Education Plan (IEP) or 504 accommodations.

The American Speech-Language-Hearing Association (ASHA) recommends that screenings be completed by SLPs through interviews with family members and/or teachers regarding concerns about the student's skills, however, screenings do not provide detailed diagnoses for TBI severity and characteristics of deficits as a result of injury (ASHA, n.d.). SLPs can determine if comprehensive assessments are necessary to evaluate performance and monitor changes in cognitive functioning for recovering students with TBI (ASHA, n.d.). However, due

to a lack of validated screening tools for this population, recommendations and referrals are typically based on developmental norms (Turkstra et al., 2015).

## Academic Programs for Managing Traumatic Brain Injury

The CDC maintains up-to-date, evidence-based information about concussion and mTBI through their HEADS UP program (Brown et al., 2019). The HEADS UP program, developed by the CDC (2016), is a series of educational initiatives to help protect children and adolescents through promoting awareness and providing education on actions to improve prevention, recognition, and response to concussion and other serious brain injuries. In return to learn programs (a step-by-step progression for helping a student return to learning after a concussion), the first step in the recovery plan, the "complete rest phase," typically lasts for up to three days depending on when the student has been symptom-free for at least 24 hours (Brain Injury Association of America, 2020). The second step involves "light thinking" activities such as playing a familiar game or listening to calm music. The final step, or return to learn phase, begins with the student attending school part-time and identifying accommodations to ensure the student's success (Brain Injury Association of America, 2020). This involves discussion with faculty and monitoring of the student's performance to ensure they don't regress (Brain Injury Association of America, 2020). BrainSTEPS (Strategies Teaching Educators, Parents and Students), a Colorado TBI program, was modeled after Pennsylvania's BrainSTEPS program and designed to support consultation with school teams and families in the development and delivery of educational services for students who have experienced acquired brain injury, including TBI (BrainSTEPS, n.d.). Teams consult with schools regarding identification, intervention selection, and intervention implementation, in addition to school re-entry planning,

IEP/504 development, long-term monitoring of students, consultation to parents of the injured student, and training on educational implications of brain injury.

## School-Based Speech-Language Pathologists and Traumatic Brain Injury

### Role in Traumatic Brain Injury

Although SLPs do not diagnose TBI's, SLPs are professionals who practice and provide services in the areas of communication and swallowing across the lifespan (ASHA, 2016). More specific areas of communication include speech production, cognition, language, fluency, voice, resonance, and hearing (ASHA, 2016). As demonstrated in previous sections of this thesis, many of these areas can be negatively affected by a TBI. For this reason, school-based SLPs are essential in providing services to screen, assess, and provide intervention for students with pediatric TBI (ASHA, n.d.). SLPs are skilled in the integration of formal and functional neurocognitive assessment measures, which can directly inform postinjury management for individuals with TBI (Brown et al., 2019). SLPs are skilled in the delivery of services to support goals for communication, learning, and independence at home, school, work, and in the community by addressing relevant health conditions and contextual factors (ASHA, 2016). Additionally, school-based SLPs have access to children with TBI over the long-term in working towards successful transitions within school, and ultimately the transition to adulthood (Ciccia et al., 2018). Although there are distinct differences when caring for students with mild compared to moderate-severe brain injuries, many clinical symptoms are similar, differing primarily in their presentation severity (Duff, 2009). SLPs can serve students with pediatric TBI by merging medical and educational models: including providing services in cognition and language, advocating for services and comprehensive assessments, as well as educating teachers,

administrators, and other team members involved in the child's return to learn plan about TBI symptoms and outcomes on learning and academic achievement (Haarauer-Krupa, 2012).

**Knowledge and Practices Patterns**

Previous studies on school-based SLPs' knowledge and confidence working with pediatric students with TBI have indicated relatively low rates for training and clinical experience for TBI (McGrane & Cascella, 2000) and a significant percentage of school-based SLPs are unfamiliar with appropriate clinical approaches for serving this population (Hux et al., 1996). Additionally, recent studies have described a lack of knowledge and clarity in the roles and obligations for SLPs serving adult and pediatric patients and students with a concussion or mTBI (Duff et al., 2002; Duff & Stuck, 2015). Awareness has increased regarding students' needs and return to learn transitions following TBI in general, however, there remains a gap in knowledge for clinical practice for mTBI and school-based services due to limited evidence regarding intervention and standards of care for this population (Duff et al., 2002; Riedeman & Turkstra, 2018). In a recent survey exploring SLP knowledge and training, SLPs reported relying on informal internet sources or asking colleagues rather than using journal articles, textbooks, or attending conferences when seeking out additional information about TBI (Riedeman & Turkstra, 2018).

General poor understanding of pediatric TBI and rapid advances in research have led to widespread misconceptions including in the field of speech-language pathology. Clinical competence is defined by having not only have solid foundational knowledge regarding the basic definitions and understanding of the injury but also flexible knowledge that addresses clinical management and treatment for best practices in the care of pediatric TBI (O'Brien, 2020). Foundational knowledge remains fairly constant addressing terminology, mechanisms of injury,

neurological and behavioral consequences, and population characteristics. This information is primarily gained in graduate education or other formal training. Flexible knowledge, which provides evidence on risk factors and management of TBI including screening, assessment, treatment, and monitoring/follow-up, requires continuous updating, especially in a young field such as speech-language pathology. Errors in foundational knowledge can have real-world implications and are difficult to correct as clinicians may not recognize that this information needs to be updated (O'Brien, 2020). This may lead to under-identification, underdiagnosis, or misdiagnosis and gaps in care for students with TBI. Flexible knowledge is typically sought out by SLPs through continuing education opportunities to identify and treat the needs of clients based on ongoing research to establish evidence-based practices. In terms of management of pediatric mTBI, misconceptions remain in both the general public and among professionals in foundational knowledge (Duff & Stuck 2015; Hux et al., 2006; Hux et al., 1996; Schellinger et al., 2018) which presents challenges for SLPs in providing appropriate intervention and being confident in doing so (O'Brien, 2020).

For children and adolescents with cognitive-communication deficits, the general approach to intervention includes direct intervention of communication deficits, metacognitive strategy instruction, and accommodations (Turkstra et al., 2015). Counseling and education play a key role in both prevention and treatment of TBI among students, their families, and school personnel to understand how cognitive changes can affect a student's learning and communication and to be an active participant in monitoring for delayed onset of symptoms after brain injury. Cognitive strategy training can help to increase a student's academic participation through implementation of environmental supports (e.g., timers, checklists) or development of internal strategies (e.g., visual imagery, chunking information; Sohlberg & Mateer, 2001).

External strategies can also take the form of accommodations in the school setting to provide students with classroom strategies to play to their strengths and support their needs. In addition to intervention practices, SLPs play a key role in symptom monitoring. They can provide appropriate cognitive/language assessments to monitor academic performance or socioemotional behaviors at school. Documentation of a child's baseline is critical for young children experiencing mTBI as evidence regarding recovery trajectory remains limited (Lundine et al., 2019). SLPs can serve to monitor and assess cognitive-communication needs and provide education and counseling on cognitive symptoms during the first days and weeks after injury and potential targeted intervention for children with persistent symptoms (Lumba-Brown et al., 2018). Although the recent CDC guidelines provide general recommendations for team management of mTBI, guidelines for best clinical practice change rapidly and SLPs must make an effort to educate themselves on current standards of care to enhance both short and long-term outcomes for children with mTBI.

## Speech-Language Pathologist Confidence and Traumatic Brain Injury

In implementation of service delivery for students with TBI, it is important to consider clinician attitudes or feelings as they will potentially influence assessment, treatment, and outcomes (Pelatti et al., 2019). To the author's knowledge, there are only 2 studies that have been published to investigate SLP confidence in providing services for TBI in the last 15 years (Pelatti et al., 2019; Riedeman & Turkstra, 2018). However, one of these studies evaluated SLP confidence in medical settings and adult TBI (Riedeman & Turkstra, 2018) or looked at "comfort" over confidence for SLPs in various settings with adults and children (Pelatti et al., 2019). There does not appear to be any current evidence evaluating school-based SLP confidence

and knowledge for pediatric TBI. Riedeman and Turkstra (2018) provided a survey to 100 medical SLPs, to evaluate their confidence and knowledge in TBI clinical practice. Some SLPs rated themselves as lacking knowledge in one or more areas of clinical practice with 4% reporting no knowledge on diagnosis and 34% reporting only some knowledge for diagnosis (Riedeman & Turkstra, 2018). In an exploratory study of 162 SLPs in any work setting within the United States measuring clinical experience, training, and comfort in providing services to children with TBI, 90% of the SLPs felt moderate to high "comfort" regarding providing services for individuals with TBI (Pelatti et al., 2019). However, SLPs who reported working in school settings were more likely to be in the low comfort group than SLPs in other settings (Pelatti et al., 2019). The U.S. Department of Education reported that in 2018-2019, only 27,000 students qualified for special education services under the category of TBI (U.S. Department of Education, National Center for Education Statistics, 2021). Due to the low prevalence of TBI on school-based SLP caseloads, SLPs are not required to obtain additional professional development specific to TBI (Pelatti et al., 2019). This can create potential issues with under-identification and underreporting due to lack of knowledge and/or experience.

## Summary/Rationale

As awareness continues to grow on the lifelong effects of pediatric TBI, SLPs play an essential role in identification and intervention of this population. Further research is necessary for investigating the relationship between school-based SLPs' confidence and knowledge of pediatric TBI and child-related factors including injury severity and age. Previous studies have indicated a significant percentage of school-based SLPs have less clinical training and experience with TBI (McGrane & Cascella, 2000) and are less comfortable with their knowledge and skills in providing services for students with TBI (Hux et al., 1996; Pelatti et al., 2019). The

purpose of this study was to identify SLP practice patterns, knowledge, and confidence levels regarding working with children and adolescents with TBI, including those with mTBI. Previous studies have not specifically targeted mild TBI when evaluating SLP knowledge and confidence. Additionally, this study aimed to evaluate SLP training and education on TBI etiology, symptom monitoring, and assessment in students with pediatric TBI and current standards of care. Lastly, knowledge of current screening and assessment procedures for mTBI and the CDC's recent guidelines established in 2018 was examined. This study aimed to characterize current education, knowledge, levels of confidence, and areas for growth and change among pediatric TBI services for school-based SLPs.

# CHAPTER III

# METHODOLOGY

The purpose of this study was to identify knowledge, confidence levels, and practice patterns among school based SLPs in the US working with students with TBI, including those with mTBI.

## Data Collection

All procedures involved in this study were approved by the Institutional Review Board (IRB) of the University of Northern Colorado prior to beginning data collection. A convenience sample was used for this study (see Appendix A). A 43-item survey was created in Qualtrics Research Suite and submitted electronically to Speech-Language Pathologists to examine their education, knowledge, and confidence levels for working with students with mTBI. The survey included an introductory message explaining the significance of the study and emphasizing that participation is voluntary. All survey questions consisted of multiple-choice, short response, and Likert-type scale formats. Survey items addressed the following areas: professional and background information, education and experience with mTBI, TBI knowledge, assessment, treatment, follow-up and/or monitoring, and confidence in assessment and treatment of mTBI. See Appendix B to view the survey.

The content of the survey items was developed following a systematic review of the literature and incorporated questions from other surveys on SLP confidence and knowledge in the area of TBI (i.e., Duff & Stuck, 2015; Hux et al., 1996; Riedeman & Turkstra, 2018). Prior to survey distribution, the survey was reviewed by SLP graduate students and SLP faculty for input and to determine face validity. Revisions were made to the wording of demographic questions

and the overall organization of the survey. Redundant questions regarding knowledge of mTBI and professional experience were omitted.

## Participants

A total of 194 respondents completed the survey across 13 states: Arizona, California, Colorado, Delaware, Georgia, Idaho, Kansas, Maryland, Michigan, Mississippi, South Carolina, South Dakota, and Texas. Respondents were at least 18 years of age and ASHA-certified SLPs in the United States who are currently working with students in school settings. Respondents were contacted through online recruitment via the ASHA Special Interest Group 02: Neurogenic Communication Disorders and the Colorado Department of Education SLP listserv. Two weeks after the initial posting of the survey to the ASHA SIG 02, a reminder was posted to the Special Interest Group encouraging completion of the survey. Additionally, school-based leaders in Florida, Virginia, and Pennsylvania were contacted to disseminate to their SLPs.

A total of 185 survey responses were used for data analysis. Of the 194 surveys completed, nine surveys were not included in data analysis because the respondent indicated that they were not currently working as an SLP in a school setting. Additionally, survey respondents were not required to answer all questions, therefore, the number of those who responded varied across items. Specific sample sizes (*n*) are provided in the results tables for each survey question.

## Data Analysis

Descriptive analysis was used to examine participant characteristics of the sample and provide the frequency of response for SLP confidence level, knowledge, and education. Descriptive and correlational analyses were completed using SPSS data analysis and statistical software, Version 27.0.

# CHAPTER IV

# RESULTS

The purpose of this study was to identify knowledge, confidence levels, and practice patterns among school based SLPs in the US working with students with TBI, including those with mTBI.

## Demographics and Traumatic Brain Injury Experience

Table 2 outlines the characteristics of the respondents who completed the survey. The number of years respondents had worked as a speech-language pathologist at the time the survey was completed ranged from 1- 40 years ($M$ = 16.03 years; $SD$ = 10.96). The number of years respondents had worked as SLPs in a school setting at the time they completed the survey also ranged from 1-40 years ($M$ = 13.71 years; $SD$ = 9.6). Average caseloads among the respondents ranged from 0-101 students ($M$ = 46.54; SD = 17.97). A majority of respondents described elementary schools as their primary facility of work (57.98%). Other facilities included secondary schools (12.23%), preschools (10.11%), special day/residential schools (0.53%) or combination of facilities (12.23%). Another 3.2% worked in administrative offices or other facilities (3.72%). Respondents were asked to indicate if they had ever personally provided services including screening, assessment, and/or intervention for students with TBI, 35.59% reported "no." A Proportionate Reduction of Error analysis was conducted to determine whether there was a relationship between respondents' type of facility and their experience providing services for students with TBI. Results of a measure of association procedure showed a weak association between the two variables ($\lambda = 0.079$) meaning that the number of errors of

prediction of a respondent's experience with TBI can be reduced to 7.9% if their type of facility is known.

For respondents' years of experience with TBI, 35.54% reported not working with this population. Other ranges of experience ranged from up to 2 years (26.0%), 3-5 years (18.67%), 6-10 years (9.04%), 11-15 years (4.22%), or 16 or more years (6.62%). A majority of respondents (90.97%) felt that they were able to qualify students with TBI that they thought should receive services. However, only 21.34% of respondents indicated that their local education agency had a formal recovery program (e.g., "Return to Learn" or brain injury programs).

## Knowledge and Education

### Knowledge

Regarding the importance of TBI knowledge to current clinical practices, 23.13% felt it was extremely important or very important (28.75%). Another 27.5% of respondents felt TBI knowledge was moderately important, while 20% felt it was slightly important or not at all important (0.63%). Additionally, a majority of respondents indicated that they were not familiar with the current CDC guidelines regarding best practices for mild TBI that was updated in 2018 (78.43%).

**Table 2**

*Characteristics of Participants*

| Survey Question | *n* (%) |
|---|---|
| Which of the following best describes where you work? (*n* = 177) | |
| Rural | 61 (34.46) |
| Suburban | 81 (45.76) |
| City/Urban | 35 (19.77) |
| Which building best describes where you work all or most of your time? (*n* = 188) | |
| Special Day/Residential School | 1 ( 0.53) |
| Preschool | 19 (10.11) |
| Elementary | 109 (57.98) |
| Secondary | 23 (12.23) |
| Administrative Office | 6 ( 3.2) |
| Combination | 23 (12.23) |
| Other | 7 ( 3.72) |
| How long have you been working as a SLP? (*n* = 172) | |
| 1 year | 10 ( 5.81) |
| 2-5 years | 31 (18.02) |
| 6-10 years | 26 (15.12) |
| 11-15 years | 27 (15.7) |
| 16-20 years | 11 ( 6.4) |
| 21 or more years | 67 (38.95) |

Table 2 (continued)

| Survey Question | *n* (%) |
|---|---|
| How long have you been working as a school-based SLP? (*n* = 173) | |
| 1 year | 11 ( 6.36) |
| 2-5 years | 36 (20.81) |
| 6-10 years | 33 (19.08) |
| 11-15 years | 25 (14.45) |
| 16-20 years | 17 ( 9.83) |
| 21 or more years | 51 (29.47) |
| How many years of experience do you have working with children with TBI? (*n* = 166) | |
| No experience | 59 (35.5) |
| 0-2 years | 43 (26.0) |
| 3-5 years | 31 (18.7) |
| 6-10 years | 15 ( 9.0) |
| 11-15 years | 7 ( 4.2) |
| 16 or more years | 11 ( 6.6) |

*Note.* SLP = speech-language pathologist.

Respondents were asked to self-report their knowledge of assessment/intervention, progress monitoring, counseling, collaboration, case management, education, prevention, and advocacy for students with mild TBI on a 4-point Likert-type scale (with 1 as "none" and 4 as "expert"). Results are reported in Table 3. Over 40% of respondents indicated having "moderate" knowledge regarding prevention, treatment, collaborating with other health care professionals in case management, and making appropriate referrals. At least 40% of respondents indicated having "some" knowledge regarding prevention, counseling individuals with mTBI, counseling family members/caregivers, and providing education. However, over 20% of respondents

indicated having no knowledge regarding assessment, counseling individuals with mTBI, counseling family members/caregivers, providing education to individuals with mTBI and their families, and advocacy.

The survey contained 10 statements concerning concussion/TBI knowledge specific to epidemiology, characteristics, and behaviors to which respondents indicated their level of agreement (see Table 4). Over 90% of respondents agreed that concussion is a brain injury, concussion can affect academic performance, signs, and symptoms of concussion can overlap with symptoms of other disorders such as depression, anxiety, and attention-deficit disorder, and concussion makes an individual more vulnerable for subsequent injury. Another 80% agreed that concussed students are eligible for accommodations such as specialized instruction or other educational accommodations. Over 65% of respondents disagreed that loss of consciousness is required for a diagnosis of concussion, recovery from concussion is complete when the individual is asymptomatic, and multiple concussions are required to observe long-term cognitive deficits. There was uncertainty indicated for some of the statements. Almost 40% of respondents were unsure if concussions result in structural damage that is visible on computerized tomography (CT) or magnetic resonance imaging (MRI) scans. Also, over 25% of respondents were unsure if children show better recovery from concussion than older individuals and if recovery from concussion is complete when the individual is asymptomatic.

**Table 3**

*Self-rated Knowledge of Mild Traumatic Brain Injury in Various Roles*

| Domain ($n$ = 152) | None $n$ (%) | Some $n$ (%) | Moderate $n$ (%) | Expert $n$ (%) |
|---|---|---|---|---|
| Prevention of mTBI | 15 ( 9.87) | 67 (44.08) | 65 (42.76) | 5 (3.29) |
| Assessment of individuals with mTBI | 33 (21.71) | 58 (38.16) | 58 (38.16) | 3 (1.97) |
| Treatment of individuals with mTBI | 20 (13.07) | 61 (39.87) | 68 (44.44) | 4 (2.61) |
| Counseling individuals with mTBI | 38 (24.84) | 72 (47.68) | 38 (24.84) | 5 (3.27) |
| Counseling family members/caregivers of individuals with mTBI | 36 (23.84) | 72 (47.68) | 40 (26.49) | 3 (1.99) |
| Collaborating with other health care professionals in case management of individuals with mTBI | 23 (15.13) | 55 (36.18) | 68 (44.74) | 6 (3.95) |
| Making appropriate referrals for individuals with mTBI | 27 (17.76) | 59 (38.82) | 61 (40.13) | 5 (3.29) |
| Educating individuals with mTBI and their families | 33 (21.71) | 68 (44.74) | 47 (30.92) | 4 (2.63) |
| Advocacy for individuals with mTBI | 36 (23.68) | 58 (38.18) | 48 (31.58) | 10 (6.58) |

*Note*. mTBI = mild traumatic brain injury.

**Table 4**

*Participant Knowledge of Concussion/Mild Traumatic Brain Injury*

| Statement | ***n*** | Agree *n* (%) | Uncertain *n* (%) | Disagree *n* (%) |
|---|---|---|---|---|
| A concussion is a brain injury. | 142 | 134 (94.37)* | 7 ( 4.93) | 1 ( 0.70) |
| Loss of consciousness is required for a diagnosis of concussion. | 141 | 16 (11.35) | 26 (18.44) | 99 (70.21)* |
| Children show better recovery from concussion than older individuals. | 139 | 80 (57.55) | 40 (28.78) | 19 (13.67)* |
| Concussion can affect academic performance. | 141 | 138 (97.87)* | 3 ( 2.13) | 0 ( 0.0) |
| Signs and symptoms of concussion can overlap with symptoms of other disorders such as depression, anxiety, and attention-deficit disorder. | 141 | 133 (94.33)* | 8 ( 5.67) | 0 ( 0.0) |
| Concussion makes an individual more vulnerable for subsequent injury. | 141 | 128 (90.78)* | 10 ( 7.09) | 3 ( 2.13) |
| Concussions result in structural damage that is visible on CT or MRI scans. | 141 | 34 (24.11) | 55 (39.01) | 52 (36.88)* |
| Concussed students are eligible for accommodations such as specialized instruction or other educational accommodations. | 141 | 114 (80.85)* | 21 (14.89) | 6 (4.26) |
| Recovery from concussion is complete when the individual is asymptomatic. | 141 | 12 (8.51) | 37 (26.24) | 92 (65.25)* |
| Multiple concussions are required to observe long-term cognitive deficits. | 141 | 14 ( 9.93) | 23 (16.31) | 104 (73.76)* |

*Note.* *Indicates the correct response.

To determine whether there was a relationship between respondents' experience providing services to students with TBI and their knowledge of TBI, each respondent's knowledge accuracy was compared to their demographic information (see Table 5). Results of a point-biserial correlation procedure showed that respondent experience was negatively related to knowledge accuracy ($r_{pb}$ = -.177, $n$ = 139, $p$ = .037) so those who had any experience providing services to students with TBI tended to perform poorer on TBI knowledge questions. However, when examining total number of years of experience working with students with TBI and knowledge accuracy were found to be positively related ($r$ = .205, $n$ = 139, $p$ = 0.016) so those who had more years of experience working with children with TBI performed better on TBI knowledge questions.

**Table 5**

*Influence of Experience Providing Services for Traumatic Brain Injury on Concussion/Traumatic Brain Injury Knowledge*

| | Experience ($n$ = 93) | | | No Experience ($n$ = 48) | | |
|---|---|---|---|---|---|---|
| Statement | Agree % | Uncertain % | Disagree % | Agree % | Uncertain % | Disagree % |
| A concussion is a brain injury. | 96.7* | 3.3 | 0.0 | 89.8* | 8.2 | 2.0 |
| Loss of consciousness is required for a diagnosis of concussion. | 11.8 | 15.1 | 73.1* | 10.4 | 25.0 | 64.6* |
| Children show better recovery from concussion than older individuals. | 54.9 | 26.4 | 18.7* | 62.5 | 33.3 | 4.2* |
| Concussion can affect academic performance. | 97.8* | 2.2 | 0.0 | 97.9* | 2.1 | 0.0 |
| Signs and symptoms of concussion can overlap with symptoms of other disorders such as depression, anxiety, and attention-deficit disorder. | 97.8* | 2.2 | 0.0 | 87.5* | 12.5 | 0.0 |
| Concussion makes an individual more vulnerable subsequent injury. | 89.2* | 8.6 | 2.2 | 93.8* | 4.1 | 2.1 |
| Concussions result in structural damage that is visible on CT or MRI scans. | 22.6 | 37.6 | 39.8* | 27.1 | 41.6 | 31.3* |

Table 5 (continued)

| Statement | Experience ($n$ = 93) | | | No Experience ($n$ = 48) | | |
|---|---|---|---|---|---|---|
| | Agree % | Uncertain % | Disagree % | Agree % | Uncertain % | Disagree % |
| Concussed students are eligible for accommodations such as specialized instruction or other educational accommodations. | 80.6* | 15.1 | 4.3 | 81.3* | 14.6 | 4.1 |
| Recovery from concussion is complete when the individual is asymptomatic. | 10.8 | 21.5 | 67.7* | 4.2 | 35.4 | 60.4* |
| Multiple concussions are required to observe long-term cognitive deficits. | 9.7 | 11.8 | 78.5* | 10.4 | 25.0 | 64.6* |

*Note*. Services include screening, assessment, and/or intervention for students with TBI.

*Indicates the correct response.

**Education**

University courses were reported as the most common area where respondents received specific training related to mild TBI (33.18%). Professional presentations were the second most common area for training (27.19%) followed by informal training from peers in their workplace (16.13%). Additional responses included formal training in their workplace (9.22%) and online courses (4.61%) and other (9.68%) which included "ASHA magazines," "through BrainSteps training/conferences," and personal experience. When respondents need additional information to work with students with mild TBI, only 14.21% of respondents indicated consulting peer-reviewed research. Completion of internet-based continuing education courses was the most popular (18.6%) followed by searching the internet (16.84%) and asking another colleague (16.67%). Other responses included attending an in-person continuing education course (12.63%), attending a professional conference such as ASHA (10.88%), consulting a textbook (8.07%), or other (2.11%). Most respondents indicated "never" completing continuing education for mild TBI (45.83%; $n$ = 73/160). Other responses included "every year" (10%; $n$ = 16/160), "every other year" (10.63%; $n$ = 17/160), "every 3-4 years" (15.63%; $n$ = 25/160), and "every 5+ years" (18.13%; $n$ = 29/160). Most respondents reported that their work facility does not hold in-service training for mild TBI and concussion prevention, assessment, and/or symptom monitoring (84.47%; $n$ = 136/161).

## Confidence

Respondents were asked to rate their level of confidence in various areas of mTBI on a 4-point Likert-type scale (see Table 6). Regarding confidence in knowledge of pediatric mTBI, a majority of respondents were "somewhat confident" (39.4%) followed by "not confident" (29.7%) and "moderately confident" (26.4%). Only 4.5% of respondents indicated being "very confident." Most respondents were only "somewhat confident" (39.3%) or "not confident" (31%) in their clinical skills when providing counseling and education to students with mTBI and their families. Only 23.9% of respondents reported being "moderately confident" and 5.8% felt "very confident." Additionally, respondents were only "somewhat confident" (30.3%) or "not confident" (26.5%) in their clinical skills when providing intervention to students with mTBI. Another 36.7% of respondents indicated "moderately confident" (36.7%) or "very confident" (6.5%).

Respondents' confidence levels regarding mTBI knowledge were compared to their experience providing services including screening, assessments, and/or intervention to students with TBI (see Table 7). A Pearson's Correlation procedure showed that experience providing TBI services was positively related to level of confidence ($r = .411$, $n = 155$, $p = .000$) so those who had provided services for TBI had higher self-rated confidence levels. To answer whether there was a relationship between respondents' confidence levels in mTBI knowledge and their concussion/TBI knowledge, respondent's self-rated confidence levels were compared to their TBI knowledge accuracy. A Spearman's Rank Order Correlation procedure indicated that respondent's confidence was negatively related to their accuracy of TBI knowledge ($\rho = -.358$, $n = 139$, $p = .000$) so those who were more confident did not perform better on TBI knowledge questions.

**Table 6**

*Participant Confidence Levels*

| Survey Question | *n* (%) total *n* = 155 |
|---|---|
| How confident are you in your knowledge of pediatric mild TBI? | |
| Very confident | 7 ( 4.5) |
| Moderately confident | 41 (26.4) |
| Somewhat confident | 61 (39.4) |
| Not confident | 46 (29.7) |
| How confident are you in your clinical skills when providing counseling and education to students with mild TBI and their parents? | |
| Very confident | 9 ( 5.8) |
| Moderately confident | 37 (23.9) |
| Somewhat confident | 61 (39.3) |
| Not confident | 48 (31.0) |
| How confident are you in your clinical skills when providing intervention to students with mild TBI? | |
| Very confident | 10 (6.5) |
| Moderately confident | 57 (36.7) |
| Somewhat confident | 47 (30.3) |
| Not confident | 41 (26.5) |

**Table 7**

*Confidence Levels and Experience Providing Students with Traumatic Brain Injury Services*

| | Experience Providing TBI Services | |
|---|---|---|
| | Experience (*n* = 100) | No Experience (*n* = 55) |
| How confident are you in your knowledge of pediatric mild TBI? | | |
| Very confident | 6 ( 6.0) | 1 ( 1.8) |
| Moderately confident | 34 (34.0) | 7 (12.7) |
| Somewhat confident | 46 (46.0) | 15 (27.3) |
| Not confident | 14 (14.0) | 32 (58.2) |

*Note*. Services include screening, assessment, and/or intervention for students with TBI.

A majority of respondents (41.61%; *n* = 67/161) rated their college and master's level coursework as "fair" in preparing them to provide services for students with TBI. Only 9.32% (*n* = 15/161) of respondents rated their college or master's level coursework as "excellent" or "good" (32.30%; *n* = 52/161). Remaining respondents rated their preparation as "poor" (11.8%; *n* = 19/161), "very poor" (0.62%; *n* = 1/161) or reported noted no training in this area (4.39%; *n* = 7/161). In rating preparation for providing services for students with TBI during graduate-level practicums or the clinical fellowship year, most respondents rated their experiences as "good" (32.92%; *n* = 53/161) or "fair" (27.33%). Only 13.66% of respondents rated their practicums or clinical fellowships as "excellent" for TBI preparation. Other respondents rated their experiences as "poor" (11.18%; *n*= 18/161), "very poor" (1.86%; *n* = 3/161), or "did not receive any training in this area" (13.04%; *n* = 21/161).

## Practice Patterns

Respondents were asked to indicate what kind of evidence they would use when making decisions about working with children with TBI. The most common evidence reported was clinician's own clinical experience (16.67%) followed by information from professional conferences (15.24%), information from web-based training (15.04%), student preferences (12.4%), information from peer-reviewed articles (12.2%), and clinical opinions of colleagues (11.99%). Less than 10% of respondents indicated using information from textbooks or a college course. Less than 1% of respondents reported using information from vendors to make clinical decisions for students with TBI.

### Assessment

Respondents were asked to indicate which areas they would assess for a student who has sustained a TBI (see Table 8). Thirteen areas were provided for respondents to select any which applied (1,112 total selections). Of the top five selected responses, expressive language was the most frequently reported domain (10.79%) followed by receptive language (10.70%), functional communication (10.43%), word-finding skills (10.34%), and pragmatic skills (10.07%).

**Table 8**

*Practice Patterns for Working with Children with Traumatic Brain Injury*

| Survey Question | *n* (%) |
|---|---|
| Areas of communication that you would assess following a TBI. (*n* = 1112) | |
| Functional communication | 116 (10.43) |
| Vocabulary | 101 ( 9.08) |
| Discourse | 92 ( 8.27) |
| Expressive language | 120 (10.79) |
| Receptive language | 119 (10.70) |
| Word-finding skills | 115 (10.34) |
| High-level language | 81 ( 7.28) |
| Pragmatic skills | 112 (10.07) |
| Problem-solving skills | 107 ( 9.62) |
| Reading comprehension | 59 ( 5.31) |
| Written language | 48 ( 4.32) |
| Decoding skills | 35 ( 3.15) |
| Other | 7 ( 0.63) |

Table 8 (continued)

| Survey Question | *n* (%) |
|---|---|
| Therapy techniques used: (*n* = 727) | |
| Counseling and education | 86 (11.83) |
| Strategy training | 75 (10.32) |
| Training in use of assistive devices | 52 ( 7.15) |
| Spaced retrieval | 30 ( 4.13) |
| Training communication partners | 52 ( 7.15) |
| Awareness training | 50 ( 6.88) |
| Conversational skills training | 78 (10.73) |
| Attention process training | 59 ( 8.12) |
| Social skills training | 82 (11.28) |
| Referral to a support group | 46 ( 6.33) |
| Goal management training | 31 ( 4.26) |
| Errorless learning | 26 ( 3.58) |
| Chaining | 32 ( 4.40) |
| Verbal mediation | 6 ( 0.83) |
| PROMPT (Prospective Memory Process Training) | 10 ( 1.38) |
| Other | 12 ( 1.65) |

Respondents reported what they would include in their assessment procedure when assessing students with mTBI. Interviews with the student and their family or significant other were the most commonly used among respondents (21.89%) followed by standardized language and cognitive tests (21.7%), non-standardized/informal evaluation procedures (19.53%), non-standardized/informal screening procedures (18.34%), and standardized screening tools

(14.79%). Less than 4% of respondents reported other procedures as part of their assessment which most commonly included “teacher input,” “observations,” and “past medical history.” Only 36.24% (*n* = 104/287) of respondents indicated that they have provided assessment for students with TBI with another 21.95% (*n* = 63/287) of respondents reporting that they have provided screenings for this population.

Respondents were asked to indicate which formal/informal assessments they use as part of their screening/assessment of children with mTBI from 8 provided areas. A majority of respondents (36.45%) indicated using other means of assessment, with almost half of this group (*n* = 16/39) indicating use of none of the provided options. The most commonly used assessment from this sample was the Health and Behavior Inventory (17.76%) followed by the Post-Concussion Symptom Inventory (PCIS; 13.08%), Post-Concussion Symptom Scale (PCSS; 9.35%), the Concussion Symptom Inventory (7.48%), and the Standardized Assessment of Concussion (5.61%). Other protocols including the Rivermead Post-Concussion Symptoms Questionnaire (RPCSQ), Sport Concussion Assessment Tool, the Graded Symptom Scale (GSS), and the Graded Symptom Checklist (GSC) were all reported below 3% in use among respondents.

**Treatment**

A total of 41.81% (*n* = 120/287) of respondents indicated that they have provided intervention for students with TBI. Respondents were asked to indicate what therapy techniques they would utilize in intervention for students with TBI (see Table 7). Counseling and education were the most commonly reported treatment reported among respondents (11.83%) followed by social skills training (11.28%), conversational skill training (10.73%), strategy training (10.32%), attention process training (8.12%), training in use of assistive devices (7.15%) and training

communication partners (7.15%). Awareness training, referral to a support group, goal management training, errorless learning, chaining, spaced retrieval, verbal mediation, Prospective Memory Process Training (PROMPT), or other techniques were reported as less than 7% use by respondents.

**Follow-up**

In regard to providing follow-up for students post-mild TBI, an overwhelming majority of respondents indicated that they "never" provide symptom monitoring (60.66%; *n* = 74/122). Other responses included "once" (5.74%; *n* = 7/122), "for 1 week" (2.46%; 3/122), "for 2-4 weeks" (9.84%; *n* = 12/122), "for 1-3 months" (9.84%; *n* = 12/122), and "for 3+ months" (11.48%; *n* = 14/122).

# CHAPTER V

# DISCUSSION AND CONCLUSIONS

The purpose of this study was to identify knowledge, confidence levels, and practice patterns among school-based SLPs in the US working with students with TBI, including those with mTBI. The results of this study were consistent with previous studies on mTBI practice (Duff et al., 2002; Duff & Stuck, 2015; Riedeman & Turkstra, 2018) and show that mTBI continues to be an area of developing knowledge and clinical practice for SLPs.

## Mild Traumatic Brain Injury Knowledge

### Misconceptions in Mild Traumatic Brain Injury Knowledge

SLPs in this study demonstrated a mix of accurate and inaccurate knowledge regarding concussion and TBI. For example, a majority of participants accurately indicated that a concussion is a form of brain injury and that TBI can affect academic performance. However, 57% of respondents in the current study stated that children show better recovery than adults from concussion. These findings are in congruence with recent evidence by Duff and Stuck (2015), in which 60% of respondents also stated this incorrect belief. This persistent misconception has been refuted in TBI literature which supports the idea that children are more susceptible to the consequences of TBI, even in cases of mTBI due to damage to neuronal development and disruption of neural networks (Anderson et al., 2011), effects of the injury on new learning (Anderson, Catroppa, et al., 2009), limited cognitive reserve (Davis et al., 2017; Field et al., 2003), and possible hormonal factors in adolescents (Davis et al., 2017; O'Brien,

2020). Additionally, 24% of respondents indicated that a concussion can result in structural damage that is visible on CT or MRI scans while another 39% were uncertain about this statement. This misconception has been also found among other studies (Duff & Stuck, 2015; Hux et al., 1996) indicating an insufficient understanding of the nature of brain injury pathology across severity levels or of the resolution of common clinical neuroimaging technology (i.e., CT and MRI are not generally appropriate for the diagnosis of mTBI or concussion). It has been hypothesized that this may be attributed to TBI training focusing more heavily on moderate or severe brain injuries than concussion or mTBI (Duff & Stuck, 2015). This persistence of inaccurate foundational knowledge raises concerns that SLPs who manage pediatric mTBI may not have the appropriate foundational knowledge required to provide the best care for their students. Specifically, misunderstanding the effects of TBI in children may result in increased reluctance by SLPs to become involved in recovery teams and the management and monitoring of TBI.

**Knowledge Barriers**

Uncertainty tends to be associated with willingness to seek out resources and become better informed, and improve awareness and care (O'Brien, 2020). However, although uncertainty and inaccurate knowledge were observed among a majority of respondents, the importance of TBI knowledge to respondents' SLP practice did not reflect this willingness. When asked to rate the level of importance of TBI knowledge to current clinical practices, half of the respondents felt that it was only moderately important to not important at all. Additionally, over 20% reported having no mTBI knowledge regarding assessments, counseling to students and their families/caregivers, providing education, or advocacy. These knowledge barriers have broad implications for the involvement of school-based SLP in the care of students with mTBI.

In order to be in a position to advocate for SLPs' role in mTBI prevention and management, SLPs must also be up to date on flexible knowledge. Although summaries of current practice guidelines and reviewed literature can be found through ASHA evidence maps, no guidelines have been established for SLPs managing pediatric mTBI. However, the CDC published new mTBI guidelines in 2018, which provided updates to both foundational knowledge (including an extended recovery timeline for children and adolescents to 1-3 months) and flexible knowledge (returning to school 2-3 days postinjury and moderate levels of activity during recovery). These guidelines serve to standardize SLP clinical practice and outline gaps in literature for future research. Unfortunately, 78% of respondents in this study indicated that they were not familiar with the new mTBI guidelines. Increased flexible knowledge among SLPs can serve to improve clinical application in educational settings. This may further support a more effective role on interdisciplinary teams for appropriate return-to-school support.

## Training and Experience

### Training

It is estimated that there are approximately 2.5 million students with TBI in the U.S. public education system annually (Dettmer et al., 2007) and US brain injury statistics suggest that a large majority of brain injury cases annually consist of mTBI and concussion (CDC, 2003). School-based SLPs play an important role in the continuum of care for children with TBI and need coursework and training in TBI to reinforce their expertise in cognition and communication. However, courses dedicated to TBI are rare and most often offered through electives in adult neurogenic disorders, even though TBI is most prevalent in pediatric populations (Duff & Stuck, 2015). Of those who received specific training for mTBI, only 33% of respondents in this study reported training through a university course. Additionally, 41% of

respondents indicated that their college/master's level coursework was only "fair" in preparing them to provide services for TBI. Lack of adequate training may increase the potential for underdiagnosis of children with subtle cognitive-communication disorders to "fall through the cracks." It may also decrease clinician confidence in providing services for children with TBI and other cognitive-based language or communication deficits.

It is essential to acknowledge that the medical and educational models in graduate training programs and professional education are not entirely separate service delivery pathways (Ciccia et al., 2021). While school-based SLPs are guided by law and the idea that their services must be academically relevant, they must take into account that school settings provide a more functional and natural treatment setting for students with TBI than medically-based facilities. Attention, working memory, and disinhibition are cognitive skills that are essential foundations for learning. A school setting provides children with TBI with a relevant and natural context to learn strategies to support these skills and help transition them to functional daily use (Sohlberg & Turkstra, 2011).

**Experience**

Over a third of respondents in this study indicated that they had never personally provided services (including screening, assessment, and/or intervention) for students with TBI. Although having any experience providing services for this population did not result in SLPs' improved knowledge accuracy, those who reported more years of experience working with TBI did have better performance on mTBI knowledge questions. As SLPs are already experiencing growing caseloads, they may not have the capacity to extend their services to students with mTBI (ASHA, 2018), thus, diminishing opportunities to gain experience working with this population.

SLPs also face process barriers such as moving through response to intervention tiers or referral for an IEP which can require months to complete (O'Brien, 2020). The Individuals with Disabilities Education Act (IDEA, 2004) allows up to 60 days for an evaluation to be completed after a child is referred followed by evaluation and discussion of eligibility among the IEP team before services can even be provided. This extends past the typical 1-month timeline for expected symptom recovery in children with mTBI. In the timeline of an academic year, 1 month is a significant amount of time for a student to be experiencing cognitive deficits or other TBI symptoms that may impact their academic performance. SLPs and educators must also consider that not all symptoms may resolve after a month such as persistent headaches, fatigue, slower processing speed, or concentration (Davis et al., 2017; Field et al., 2003). These symptoms should be carefully monitored by a professional "return-to-learn" or brain injury team who can provide informal support during this transitional period before potential formal testing.

Brain injury teams offer an opportunity for SLPs to increase their concussion knowledge and to educate other school personnel on how brain injury affects learning and the SLP scope of practice (Haarauer-Krupa, 2012). Unfortunately, only 21% of respondents in this study reported having a formal recovery team for pediatric TBI at their facility. This presents increased potential for children with TBI not being identified through screening and monitoring procedures as they return to school to ensure that any professional support they need is available to them. A team approach to identifying and providing services to children with concussion ideally promotes cognitive, communicative, academic, and social success. Even SLPs who do not have extensive training or experience in brain injury can find ways to create dialogues with other stakeholders and provide education to other professionals who may not understand how students would benefit from the inclusion of an SLP on a brain injury team.

## Confidence

Although a majority of participants reported experience working with students with TBI, 30% rated themselves as "not confident" in knowledge of mTBI, and another 39% rated themselves as only "somewhat confident." This might be accounted for by the Dunning-Kruger effect (Kruger & Dunning, 1999) where clinicians with the most skill provide low self-ratings and less skilled clinicians provided higher self-assessments. This effect is supported in the finding that respondents' mTBI knowledge accuracy was negatively correlated to increased levels of confidence in mTBI knowledge. While only 14% of those with experience reported "not confident," 58.2% of those without experience reported "not confident." Over half of respondents also reported lower levels of confidence in clinical skills providing counseling and education to students with mTBI and their families and in providing intervention to students with mTBI. These findings are consistent with Hux et al.'s (1996) study in that school-based SLPs reported not feeling very confident regarding service delivery for children with TBI. As these areas are within the SLP scope of practice (ASHA, 2016), training in graduate programs and professional education are vital in providing school-based SLPs with knowledge and experience with this population. With counseling and education serving as the primary therapy technique reported among respondents, lower levels of clinician confidence within this area present concern and potentially be a beneficial area for growth in graduate training and professional education opportunities.

Years of experience offering services to students with TBI served as a significant predictor in school-based SLP confidence levels in knowledge of mTBI in this study. This provides support for the idea that confidence levels increase through applied exposure and practice acquired over years of experience and professional development training to address

flexible knowledge. However, school-based SLPs may choose to not obtain additional professional development specific to TBI due to low incidence rates of this communication disorder on their caseloads. And although more children are being identified as having TBI, only 27,000 students were found to have qualified for special education services under the verification category of TBI in 2019 (U.S. Department of Education, National Center for Education Statistics, 2021). This creates a reoccurring problem of SLPs having less knowledge and/or experience with TBI, further contributing to insufficient experience and potentially under-identification and underreporting (Pelatti et al., 2019).

## Practice Patterns

### Clinical Decision-Making

Although peer-reviewed articles had low reported rates for clinical decision-making for students with mTBI, respondents reported using an assortment of other sources of evidence, primarily their own clinical experience. However, with 35% of school-based SLPs indicating that they had no experience providing services for students with TBI and previously addressed gaps in foundational knowledge, SLPs may not be making informed or evidence-based decisions when working with this population. Forty-five percent of respondents also indicated that they have never completed continuing education on mild TBI, which may reduce awareness among SLPs regarding changes to flexible knowledge through ongoing research therefore decreasing opportunities for this knowledge to be circulated to clinical and educational settings. This may be challenging given the rapid growth of research emerging annually. Furthermore, school-based SLPs may be facing barriers specific to limited financial support from their schools regarding options of professional development and may choose to attend trainings that are specific to populations that account for a majority of their caseloads (Pelatti et al., 2019).

**Assessment**

School-based SLPs may not be equipped with appropriate assessment measures to identify children with cognitive-communication disorders as a result of TBI. Respondents reported primarily using interviews with the student and their family or standardized language and cognitive tests. However, standardized cognitive-communication assessments specifically for children and adolescents with TBI are limited and may not identify subtle difficulties often noted among children with mTBI (ASHA, n.d.; Turkstra et al., 2015). Formal and informal evaluation options discussed in this survey were based on the updated CDC recommendations for assessment of pediatric mTBI (Lumba-Brown et al., 2018), however, literature on mTBI assessment is primarily from the field of neuropsychology rather than speech-language pathology (Duff, 2009). A majority of respondents reported not utilizing any of the provided options or wrote in responses including the Clinical Evaluation of Language Fundamentals (CELF) or the Test of Language Development (TOLD). The CELF has been reported as a commonly used assessment tool for pediatric TBI among school-based SLPs (Duff & Stuck, 2015). However, these assessments were not normed on children with TBI, and interpretation of these results should be guarded and may prevent detection of an individual's deficits that are required for referrals or eligibility of support services. Additionally, assessments such as the CELF-4 assess developmental language, and additional measures of complex language tasks are not typically assessed in the schools. Students returning to school after sustaining a TBI may demonstrate deficits in executive functioning and social cognition. However, they are likely to receive average scores on developmental language assessments, making them less likely to qualify for traditional speech-language services (Ciccia et al., 2021). There continues to be a

need for assessment and screening tools in speech-language pathology that are sensitive and specific to pediatric mTBI.

**Intervention**

Respondents most commonly reported using counseling and education for therapy techniques followed by social skills training and strategy training. Providing education to school providers on the symptomology of cognitive-communication disorders is important to discourage attribution of subtle academic difficulties to "poor attitude," "lack of motivation" or other incorrect causes (Turkstra et al., 2015). Social skills training often involves training a child's communication partners including the child's teachers or other educators and helping them to provide necessary support, structure, and instruction (ASHA, n.d.). Although deficits post-TBI do not always manifest as pragmatic difficulties, social skills training can address impulsivity and provide training of self-regulation and self-monitoring strategies in a child's natural environment, the school. In the case of mTBI, accommodations may serve as a temporary solution during a child's recovery period or may be implemented or continued with prolonged effects of TBI as appropriate. Although individualization of treatment techniques based on a student's deficits and needed support is ideal, school-based SLPs may benefit from more consistent recommendations on management for students with mTBI as certain techniques may be more appropriate for moderate to severe brain injuries.

**Follow-Up**

Research has shown that over 60% of children with TBI do not receive school-based services due to uncaptured delayed effects of injury and failure to provide long-term monitoring (Todis, 2007). Over 60% of respondents in this study reported "never" providing symptom monitoring for students with mTBI. With evidence supporting longer recovery timelines and

CDC recommendations for mTBI suggesting 1-3 months, this presents a clear issue for students not receiving appropriate support or increases the chances of missing delayed effects of injury. With growing caseloads among school-based SLPs and with a majority of students thought to make a full recovery without intervention, it may be viewed as unrealistic to extend already limited time to this population. However, estimates suggest that 30-37% of high school and college-age students sustain at least one brain injury (Segalowitz & Lawson, 1995) and 16% of children sustain one or more brain injuries that require medical attention by age 10 (Ylvisaker et al., 1998). Although students with mTBI may represent a small minority, SLP involvement among interdisciplinary teams to provide education on signs and symptoms of concussion, potential delayed effects on injury, and ongoing communication among stakeholders if a student with a history of brain injury begins having academic or social difficulty could serve to increase accuracy and timely identification of student needs and reduce negative outcomes for students (Duff & Stuck, 2015).

## Clinical Implications

The results of this study are of particular relevance for school-based SLPs and address the importance of training, education, and knowledge to provide appropriate services for children with mTBI. The results demonstrated a continued gap in TBI knowledge among SLPs which may lead to lower levels of confidence in addition to fewer opportunities to gain experience providing services for pediatric TBI in educational settings. Lack of consistency in training or professional education and practice patterns can result in gaps in care between school and medical settings and may impede SLP involvement among interdisciplinary or brain injury teams in providing services for children with TBI. Although foundational and flexible knowledge regarding TBI continues to be an area for improvement, there presents an increased need to

address clinician confidence in providing counseling and education. These areas serve a vital role in both TBI prevention and management and within the role of the SLP among a brain injury team.

As advances in understanding and management of mTBI continue, there presents an opportunity for increased awareness around the vital role of SLPs in the assessment and treatment of children following mTBI. Although the recently released CDC guidelines provide specific recommendations for identification, assessment, and treatment of children with mTBI, they do not address specific involvement of professionals such as speech-language pathologists. Ongoing discussion and research regarding functional and appropriate assessment and treatment practices specific to the pediatric mTBI population are crucial, particularly within the young field of speech-language pathology.

## Limitations

Responses from this survey should be interpreted with caution as several methodological limitations of this research study exist. First, the sample size ($n$ = 194) is likely not a representation of the school-based SLP population in the US. Additionally, the current study only captures current knowledge of school-based SLPs in some US states. These responses may not be an accurate reflection of SLPs across the US or other countries. Despite these limitations, this study does appear to provide preliminary evidence regarding relationships between SLP confidence, knowledge, and experience with students with mTBI.

The wording of some survey questions (e.g., “please select any of the following areas of communication that you would assess following a TBI”) may require the assumption that all students with TBI regardless of severity should be assessed or that a student would be experiencing long-term symptoms from a concussion. This critique could also apply to treatment

and monitoring questions. Assessment options discussed in the context of the survey may not be available to school-based SLPs or may be more utilized by neuropsychologists, which few SLPs may be trained to administer. Although treatment methods included within the survey were identified from TBI literature they may not be familiar to all school-based SLPs. It is important to be aware of what assessment and treatment options are used by SLPs in medical and educational settings and whether these approaches have evidence-based support when working with children. Further research regarding mTBI knowledge, training, confidence levels, and practice patterns is warranted.

## Conclusion

An SLP's scope of practice includes engagement in collaboration, education, prevention, and advocacy in cognitive-communication for both children and adults (ASHA, 2016). This study provided evidence on knowledge, confidence levels, and practice patterns for treating students with mTBI among school-based SLPs. Although the field of speech-language pathology has grown as a profession in our understanding of cognitive-communication disorders, gaps in our knowledge base remain. These gaps present barriers among school-based SLPs in their confidence levels, experiences, and practice patterns for providing services to students with mTBI. The findings of this study provide evidence to promote conversation in addressing training and professional education opportunities for pediatric mTBI, advocacy for SLPs' role within brain injury teams, and establishing better practices for service delivery for students who have sustained mTBIs or other brain injuries in the schools.

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# APPENDIX A

# INSTITUTIONAL REVIEW BOARD APPROVAL

UNIVERSITY OF
NORTHERN COLORADO

Institutional Review Board

| | |
|---|---|
| Date: | 02/16/2021 |
| Principal Investigator: | Jessica Munson |
| Committee Action: | **IRB EXEMPT DETERMINATION – New Protocol** |
| Action Date: | 02/16/2021 |
| Protocol Number: | 2011015453 |
| Protocol Title: | Speech-Language Pathologists' Confidence Levels, Knowledge, and Practice Patterns with Mild TBI in the Schools |
| Expiration Date: | |



The University of Northern Colorado Institutional Review Board has reviewed your protocol and determined your project to be exempt under 45 CFR 46.104(d)(702) for research involving

Category 2 (2018): EDUCATIONAL TESTS, SURVEYS, INTERVIEWS, OR OBSERVATIONS OF PUBLIC BEHAVIOR. Research that only includes interactions involving educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior (including visual or auditory recording) if at least one of the following criteria is met: (i) The information obtained is recorded by the investigator in such a manner that the identity of the human subjects cannot readily be ascertained, directly or through identifiers linked to the subjects; (ii) Any disclosure of the human subjects' responses outside the research would not reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, educational advancement, or reputation; or (iii) The information obtained is recorded by the investigator in such a manner that the identity of the human subjects can readily be ascertained, directly or through identifiers linked to the subjects, and an IRB conducts a limited IRB review to make the determination required by 45 CFR 46.111(a)(7).

You may begin conducting your research as outlined in your protocol. Your study does not require further review from the IRB, unless changes need to be made to your approved protocol.

**As the Principal Investigator (PI), you are still responsible for contacting the UNC IRB office if and when:**

UNIVERSITY OF
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Institutional Review Board

- You wish to deviate from the described protocol and would like to formally submit a modification request. Prior IRB approval must be obtained before any changes can be implemented (except to eliminate an immediate hazard to research participants).
- You make changes to the research personnel working on this study (add or drop research staff on this protocol).
- At the end of the study or before you leave The University of Northern Colorado and are no longer a student or employee, to request your protocol be closed. *You cannot continue to reference UNC on any documents (including the informed consent form) or conduct the study under the auspices of UNC if you are no longer a student/employee of this university.
- You have received or have been made aware of any complaints, problems, or adverse events that are related or possibly related to participation in the research.

If you have any questions, please contact the Research Compliance Manager, Nicole Morse, at 970-351-1910 or via e-mail at nicole.morse@unco.edu. Additional information concerning the requirements for the protection of human subjects may be found at the Office of Human Research Protection website - http://hhs.gov/ohrp/ and https://www.unco.edu/research/research-integrity-and-compliance/institutional-review-board/.

Sincerely,

Nicole Morse
Research Compliance Manager

University of Northern Colorado: FWA00000784

# APPENDIX B

## SURVEY OF SELF-PERCEIVED KNOWLEDGE, CONFIDENCE, AND PRACTICE PATTERNS OF SCHOOL-BASED SPEECH-LANGUAGE PATHOLOGISTS (SLPs) WORKING WITH STUDENTS WITH MILD TRAUMATIC BRAIN INJURY (mTBI)

# SURVEY OF SELF-PERCEIVED KNOWLEDGE, CONFIDENCE, AND PRACTICE PATTERNS OF SCHOOL-BASED SPEECH-LANGUAGE PATHOLOGISTS (SLPs) WORKING WITH STUDENTS WITH MILD TRAUMATIC BRAIN INJURY (mTBI)

Primary Researcher: Jessie Munson, B.S., Graduate Student in Speech-Language Pathology, University of Northern Colorado, (818) 823-9594, jessica.obrian@unco.edu

Research Advisor: Kim Murza, Ph.D., CCC-SLP, Department of Audiology & Speech-Language Sciences Program, University of Northern Colorado (970) 351-1084, kim.murza@unco.edu

Hello and Welcome,

The purpose of this study is to gather information regarding your current practices, knowledge, education, and confidence levels working with students with mild traumatic brain injury (TBI). If you agree to participate in this study, you will click "next" below and complete a single survey which will take 10-15 minutes.

Your identifying information will not be used in any presentation of results of this study. There are no expected risks for taking part in this study. Results from this study may help provide evidence for further opportunities to explore improving SLP confidence in working with students with TBI.

Participation is voluntary. You may decide not to participate in this study and if you begin participation you may still decide to stop and withdraw at any time. Your decision will be respected and will not result in loss of benefits to which you are otherwise entitled. Having read the above and having had an opportunity to ask any questions please complete the questionnaire if you would like to participate in this research. If you have any concerns about your selection as a research participant, please contact Nicole Morse, Research Compliance Manager, Office of Research, Kepner Hall, University of Northern Colorado, Greeley, CO 80639; 970-351-1910

Thank you for participating in this important study!

**Section 1: Demographics**

1. Are you currently a school-based SLP?

    - Yes
    - No

2. Have you ever personally provided services, including screening, assessment, and/or intervention for students with TBI?
    - Yes
    - No

3. If yes, please select all that you have provided.

    - Screening
    - Assessment
    - Intervention

4. Which one of the following best describes where you work?

    - Rural
    - Suburban
    - City/Urban

5. Although you may work in several types of facilities, select the one type of building that best describes where you work all or most of your time?
(Please answer all future questions with reference to your work in this setting)

    - Special Day/Residential School
    - Preschool
    - Elementary
    - Secondary
    - Administrative Office
    - Combination
    - Other: specify

6. In what state is your primary employment facility located?

    - Alabama
    - Alaska
    - Arizona
    - Arkansas
    - California
    - Colorado
    - Connecticut
    - Delaware
    - Florida
    - Georgia
    - Hawaii
    - Idaho
    - Illinois
    - Indiana
    - Iowa
    - Kansas
    - Kentucky
    - Louisiana

- Maine
- Maryland
- Massachusetts
- Michigan
- Minnesota
- Mississippi
- Missouri
- Montana
- Nebraska
- Nevada
- New Hampshire
- New Jersey
- New Mexico
- New York
- North Carolina
- North Dakota
- Ohio
- Oklahoma
- Oregon
- Pennsylvania
- Rhode Island
- South Carolina
- South Dakota
- Tennessee
- Texas
- Utah
- Vermont
- Virginia
- Washington
- West Virginia
- Wisconsin
- Wyoming

7. Although you may perform more than one job function, select the one position that best describes how you spend most of your time. (Only one response will be accepted)

    - Clinical service provider
    - Diagnostician
    - Special Education teacher
    - Consultant
    - Administrator/Supervisor/Director
    - Other: (_____)

8. How long have you been working as a speech-language pathologist? (*Round to the nearest full year*)

    - (_____)

9. How long have you been working as a school-based speech-language pathologist? (*Round to the nearest full year*)

    - (_____)

10. How long have you been employed at your identified workplace? (*Round to the nearest full year*)

    - (_____)

11. How many SLPs work at your facility?

    - (_____)

12. How many students are on your caseload?

    - (_____)

13. Please rate the following areas (on a scale from 1 to 9) according to which areas of intervention you primarily serve (1= least amount of caseload, 9 = majority of caseload)

    - Executive functioning
    - Language disorders: semantics, morphology, syntax
    - Nonverbal, augmentative and alternative communication (AAC)
    - Reading and writing (literacy)
    - Selective mutism
    - Social communication/Pragmatics
    - Speech sound disorders
    - Voice or resonance disorders
    - Other (_____)

14. How many years of experience do you have working with children with TBI?

- I don't work with TBI
- Less than 1
- 1-2
- 3-5
- 6-10
- 11-15
- 16-20
- 21 or more

15. What portion of your caseload consists of children with TBI?

- None
- 1 student
- 2-5 students
- 6-10 students
- 11-15 students
- 16-20 students
- 21 or more students

16. What portion of your caseload of children with TBI are considered to be mild TBI?

- None
- Less than 5%
- 6-15%
- 16-25%
- 26-50%
- Greater than 50%

17. Considering your entire caseload of children with TBI, please rate the following areas (on a scale from 1 to 9) according to which areas of intervention you primarily serve (1= least amount of caseload, 9 = majority of caseload):

- Executive functioning
- Language disorders: semantic, morphology, syntax
- Nonverbal, augmentative and alternative communication (AAC)
- Reading and writing (literacy)
- Selective mutism
- Social communication/Pragmatics
- Speech sound disorders
- Voice or resonance disorders
- Other (_____)

18. Are you involved in any "return-to-learn" programs at your setting? (*Programs that involve a step-by-step progression for helping a student return to learning after a concussion or brain injury*)

    - Yes
    - No

    - *Optional Question* (if yes)
      - What is your role on this program?
        - (_____)

    - *Optional Question* (if no)
      - What barriers do you feel prevent your local education agency from having a recovery program?
        - (_____)

19. Have you ever been unable to qualify students with TBI who you felt should receive services?

    - Yes
    - No

    - *Optional Question* (if yes)
      - What were the barriers
        - (_____)

**Section 2: Pre-Service Training & Continuing Education**

1. How important do you feel **knowledge** about TBI is to your current clinical practice?

    - Extremely important
    - Very important
    - Moderately Important
    - Slightly important
    - Not important at all

2. How would you rate your college and master's level coursework in preparing you to provide services for students with TBI?

    - Excellent
    - Good
    - Fair
    - Poor
    - Very poor
    - I did not receive any training in this area

3. How would you rate your graduate level practicum and clinical fellowship year in preparing you to provide services for students with TBI?

    - Excellent
    - Good
    - Fair
    - Poor
    - Very poor
    - I did not receive any training in this area

*Mild TBI is defined as a loss of consciousness for less than 30 minutes, and initial Glasgow Coma Scale of 13-15 after 30 minutes of injury onset and post-traumatic amnesia (PTA) not exceeding 24 hours (CDC, 2015). Concussion, a form of mild TBI, occurs as a result of a blow, bump or jolt to the head, face, neck, or body that may or may not result in loss of consciousness.*

4. Have you ever received specific training related to TBI? If so, check all specific training you have received:

    - Formal training in my workplace
    - Informal training from peers in my workplace
    - Professional presentation
    - University course
    - Online course
    - Other, please list (_____)

5. If you need additional information to work with patients with TBI, where would you seek information? Please select all that you would use

    - Ask another colleague
    - Consult a textbook
    - Read an article
    - Search the Internet
    - Complete an Internet-based continuing education course
    - Attend an in-person continuing education course
    - Attend a professional conference such as American Speech-Language-Hearing Association
    - Other, please list (_____)

6. How often do you complete continuing education for mild TBI?

    - Never
    - Every year
    - Every other year
    - Every 3-4 years
    - Every 5+ years

7. Does your work facility hold in-service training for mild TBI and concussion prevention, assessment and/or symptom monitoring?

    - Yes
    - No

    - *Optional Question* (if yes)
        - What is your role in these trainings?
            - Participant
            - Facilitator/Presenter
            - Other, please list (_____)

**Section 3: Confidence Levels**

1. How confident are you in your **knowledge** of pediatric TBI?

    - Very confident
    - Moderately confident
    - Somewhat confident
    - Not confident

2. How confident are you in your clinical skills when providing counseling and education to students with TBI and their parents?

    - Very confident
    - Moderately confident
    - Somewhat confident
    - Not confident

3. How confident are you in your clinical skills when providing intervention to students with TBI?

    - Very confident
    - Moderately confident
    - Somewhat confident
    - Not confident

**Section 4: Knowledge**

1. For individuals with mild TBI, SLPs play a role in diagnosis, assessment, intervention, counseling, collaboration, case management, education, prevention and advocacy. Please rate your knowledge in each of the following domains. (*Ratings are on a four-point scale: none, some, moderate, or expert)*

    - Prevention of TBI
    - Assessment of individuals with mild TBI
    - Treatment of individuals with mild TBI
    - Counseling individuals with mild TBI
    - Counseling family members/caregivers of individuals with mild TBI
    - Collaborating with other health care professionals in case management for individuals with mild TBI
    - Making appropriate referrals for individuals with mild TBI
    - Educating individuals with mild TBI and their families
    - Advocacy for individuals with mild TBI

2. Are you familiar with the current CDC guidelines regarding best practices for mild TBI which were updated in 2018?

    - Yes
    - No

    - *Optional Question* (if yes)
        - Do you use these current guidelines to advocate for your role in management of mild TBI in students?
            - Yes
            - No

3. Please rate each of the following (Agree, Uncertain, Disagree)

    - A concussion is a brain injury.
    - Loss of consciousness is required for a diagnosis of concussion.
    - Children show better recovery from concussion than older individuals.
    - Concussion can affect academic performance.
    - Signs and symptoms of concussion can overlap with symptoms of other disorders such as depression, anxiety, and attention-deficit disorder.
    - Concussion makes an individual more vulnerable for subsequent injury.
    - Concussions result in structural damage that is visible on CT or MRI scans.
    - Concussed students are eligible for accommodations such as specialized instruction or other educational accommodations.
    - Recover from concussion is complete when the individual is asymptomatic.
    - Multiple concussions are required to observe long-term cognitive deficits.

**Section 5: Practice Patterns**

1. Indicate which of the following you include in your assessment procedure when assessing students with mild TBI: (*Select all that apply*)

    - Standardized screening tools
    - Non-standardized/Informal screening procedures
    - Standardized language and cognitive tests
    - Non-standardized /informal evaluation procedures
    - Interviews with student and their family or significant other
    - Other, please list (_____)

2. Which of the following assessments do you use as part of your evaluation of children with mild TBI? (*Select all that apply*)

    - Post-Concussion Symptom Inventory (PCIS)
    - Concussion Symptom Inventory (CSI)
    - Health and Behavior Inventory
    - Graded Symptom Scale (GSS)
    - Graded Symptom Checklist (CSC)
    - Post-Concussion Symptom Scale (PCSS)
    - Rivermead Post-concussion Symptoms Questionnaire (RPCSQ)
    - Standardized Assessment of Concussion
    - Sport Concussion Assessment Tool
    - Other, please list (_____)

3. How often do you typically provide symptom monitoring for students post-mild TBI?

    - Never
    - Once
    - For 1 week
    - For 2-4 weeks
    - For 1-3 months
    - For 3+ months

4. What kind of evidence do you use when making decisions about working with children with TBI? (Please select all that you use)

    - Student's preferences
    - Information from a college course
    - Clinical opinions of colleagues
    - Information from vendors
    - Your own clinical experience
    - Information from professional conferences
    - Information from web-based trainings
    - Information from peer-reviewed articles
    - Information from textbooks

5. Please select any of the following areas of communication that you would assess following a TBI. (*Select all that apply*)

- Functional communication
- Vocabulary
- Discourse
- Expressive language
- Receptive language
- Word-finding skills
- High-level language
- Pragmatic skills
- Problem-solving skills
- Reading comprehension
- Written language
- Decoding skills
- Other, please list (_____)

6. Therapy Techniques used: (*Select all that apply*)

- Counseling and education
- Strategy training
- Training in use of assistive devices
- Spaced retrieval
- Training communication partners
- Awareness training
- Conversational skills training
- Attention process training
- Social skills training
- Referral to a support group
- Goal management training
- Errorless learning
- Chaining
- Verbal mediation
- PROMPT (Prospective Memory Process Training)
- Other, please list (_____)