THE ROLE OF THE SPEECH LANGUAGE PATHOLOGIST IN CONCUSSION MANAGEMENT: A SURVEY ANALYSIS

by

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THESIS ABSTRACT

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Primary objective. The goals of this project were to review the current literature regarding the role of the speech-language pathologist (SLP) in concussion management and to conduct a survey of SLPs with experience in concussion care to determine their current practices and perspectives.

Design and methods. An online survey consisting of 41 questions was emailed to SLPs throughout the U.S. and Canada. Responses were anonymously collected from 60 SLPs, and the responses were analyzed.

Results and conclusions. Results showed that SLPs who work in concussion care are generally knowledgeable and confident despite how recently concussion has become part of SLP practice. There has been improvement in the types of assessment tools used in concussion cases, but there is a need for more sensitive instruments. Findings point to the need for increased availability of concussion training for SLPs and the need for continued research into current clinical practices.

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CHAPTER I

INTRODUCTION

The aims of this project are two-fold. First, this paper presents a review of the current literature to discuss the role of the speech-language pathologist (SLP) within the changing landscape of concussion management. Second, through the analysis of survey responses gathered from 60 practicing SLPs, this project aims to describe the training, perspectives, and adherence to best practices among clinicians who are actively assessing and treating concussion cases.

A Review of the Literature

The past two decades have seen extraordinary growth in public interest and media attention surrounding concussion, both in the U.S. and abroad. Growing awareness about sports-related concussion, as well as the impact of traumatic brain injury (TBI) on soldiers returning from recent military conflicts, has contributed to both public knowledge and expanding research into concussion (Guay et al., 2014; Jackson et al., 2017). A rapidly growing body of research across many disciplines—including neurology, sports medicine, rehabilitation sciences, neuropsychology, and education—has led to a shift in our understanding of the nature of concussion, and it has also led to emerging evidence-based clinical guidelines for concussion management. As experts in cognitive communication disorders, SLPs are one of several rehabilitation specialists who have become increasingly involved in the assessment and treatment of concussion. However, in spite of their charge to treat this population, there is a paucity of information in the literature about the SLP's role in concussion care, and more importantly, how best to treat concussion symptoms.

This literature review will discuss the current research pertaining to the nature, prevalence, and epidemiology of concussion; emerging clinical practice guidelines for concussion management; and the research specific to SLPs and concussion.

Defining concussion. The U.S. Department of Veteran Affairs (VA) and the Centers for Disease Control and Prevention (CDC) define TBI as a disruption of brain function caused by an external force or blow to the head that induces or worsens any of the following: loss of consciousness (LOC), any degree of post-traumatic amnesia (PTA), neurological deficits, or an intracranial lesion (2015; 2016). Within this clinical definition, TBIs are further categorized by severity, including severe, moderate, and mild TBI. Concussion, referred to interchangeably throughout the literature as mild traumatic brain injury (mTBI), refers to a TBI that is classified as mild based on the following four parameters: (1) normal structural imaging, (2) LOC ranging from 0 to 30 minutes, (3) alteration of consciousness or mental state lasting no more than 24 hours, and (4) a Glasgow Coma Scale (GCS) rating of 13 to 15 within 24 hours post-injury (U.S. Department of Veteran Affairs, 2013). This is the clinical definition of concussion that will be assumed for the purposes of this paper, although it is recognized that there is ongoing debate about how best to define concussion within the literature and clinical practice contexts.

Historically, researchers and practitioners have used varying definitions to describe concussion and its resulting symptoms, making it difficult to diagnose and study (Carroll, Cassidy, Holm, Kraus, & Coronado, 2004). Some researchers have defined concussion as a brain injury without LOC, other definitions have *required* LOC to meet diagnostic criteria, and still others have relied on varying GCS ratings or differing ICD

codes assigned by medical providers (Grubenhoff, Kirkwood, Deakyne, & Wathen, 2011; Kristman et al., 2014; Laker, 2011; Suhr & Gunstad, 2005). Terminology used in the literature and in practice further confounds definitional challenges by using concussion, mild traumatic brain injury, mild head injury, and minor head injury interchangeably.

One of the recent evolutions in the understanding of concussion has been the recognition of the complex, dynamic interplay of pre-injury factors, mechanisms of injury, and the resulting sequelae of symptoms (Kamins & Giza, 2016; Namjoshi et al., 2017; Silverberg & Iverson, 2011). As we learn more about the nature of mTBI, its definition is shifting away from a binary description that confirms or denies the presence of a concussion toward a more nuanced definition that delineates profiles of underlying pathophysiology and symptom clusters (Kamins & Giza, 2016; Namjoshi et al., 2017). In recent years, researchers have proposed definition frameworks to better capture the complex biological, psychological, and social factors that contribute to mTBI (Kamins & Giza, 2016; Silverberg & Iverson, 2011). A promising model is the biopsychosocial model of concussion that conceptualizes concussion symptoms as an interplay between pre-injury factors, injury characteristics, and response to injury (Silverberg & Iverson, 2011).

Recent experimental research has suggested that advancements in imaging techniques, such as Diffuse Tensor Imaging (DTI), as well as the identification of biomarkers linked to brain injury, could provide further resources for accurate diagnosis and subcategorization of types of concussion (Levin & Diaz-Arrastia, 2015; Namjoshi et al., 2017; Zetterberg, Smith, & Blennow, 2013). It seems likely that continued interest

and research regarding concussion could soon lead to a significant shift in the widely accepted clinical definitions of mTBI.

Prevalence and impact. There is significant variation among estimates of incidence and impact of mTBI. The CDC has estimated that 2.2 to 3.2 million people visit the emergency room annually for TBI in the U.S. and that approximately 84% of these cases are classified as mTBI (CDC, 2014). However, our current understanding of the epidemiology of concussion relies heavily on data from emergency department visits, and many people do not seek medical care for mild head injury (Faul, Wald, Xu, & Coronado, 2010; Faul & Coronado, 2015). The invisibility of concussion cases in the health care system, combined with the variability in diagnosis and definition of mTBI, make the number of cases in the U.S. difficult to count, and research suggests that the numbers could potentially be much larger than current estimates (CDC, 2014; Laker, 2011; Levin & Diaz-Arrastia, 2015). Some researchers estimate that the true number of annual concussions in the U.S. could be as high as 3.8 million (CDC, 2006; Faul & Coronado, 2015).

Although some populations are widely known to be at risk for mTBI, such as combat veterans and professional athletes, concussion is certainly not isolated to these groups. While concussion in these populations has generated significant media attention, most concussions are not, in fact, a result of combat-related injuries or contact sports. The two most frequent causes of mTBI—and traumatic brain injury more broadly—are motor vehicle accidents (MVAs) and falls (CDC, 2014; Rowe et al., 2016). In terms of age distribution, the highest rate of emergency room visits for TBI are young children (0-4 yrs.), teens (15-19 yrs.), and those older than 75 years of age (CDC, 2014; Faul et al.,

2010). Given the recent surge in public awareness of concussion, rates of emergency room visits related to mTBI have increased, particularly for sports-related incidents in teens and young adults (Hootman, Dick, & Agel, 2007; Kamins & Giza, 2016). Overall, the incidence of concussion among males is higher than it is for females, particularly among children and teens (Kamins & Giza, 2016; Faul & Coronado, 2015). There is emerging evidence, however, to suggest that females may be at a higher risk of sustaining a concussion—and a prolonged recovery—than males when performing the same activity, although the reason for this difference is yet unknown (Baker et al., 2016; Covassin & Elbin, 2011; Kamins & Giza, 2016).

Most cases of concussion recover fully within 7 to 10 days, but there is a subset of people for whom symptoms persist for months, sometimes resulting in chronic functional impairment and disability (CDC, 2003; Faul & Coronado, 2015; Williams, Puetz, Giza, & Broglio, 2015). Despite its appearance in the literature since the early 20th century (McAllister & Arciniegas, 2002), the prevalence of this post-concussion syndrome (PCS) has been widely debated. Much of the research estimates that PCS impacts approximately 10-15% of people who suffer a concussion (Bigler, 2008; Faul et al., 2010). Some studies, however, report that closer to just 5% of patients with concussion will experience long-term effects. Still others suggest that the percentage of patients with long-term post-concussion symptoms could be as high as 40—or even 60%—especially in pediatric populations (Babcock et al., 2013; Mittenberg & Strauman, 2000; Voormolen et al., 2018). Although our understanding of PCS and its prevalence is still emerging, we know that there are many people who experience persistent, and sometimes chronic, cognitive, physical, and emotional impact from concussion.

Post-concussion syndrome (PCS). There is no uniform profile of symptoms that defines the course of a typical concussion, but there is consensus among the literature that mTBI involves an acute phase immediately post-injury with symptoms that typically recover within 7 to 10 days (Kristman et al., 2014; Marar, McIlvain, Fields & Comstock, 2012). The acute phase of concussion commonly includes any combination of the following symptoms: headache, drowsiness, dizziness or imbalance, visual changes, light sensitivity, confusion or fogginess, nausea, vomiting, sleep disturbance, impaired concentration, depression, and irritability (Broglio & Puetz, 2008; Kamins & Giza, 2016; Marar et al., 2012). Some people with mTBI experience LOC and PTA, while others report just one or two mild symptoms post-injury (Kristman et al., 2014; Marar et al., 2012). Neurocognitive symptoms experienced during this acute phase of injury may resolve within the first few days, but mild symptoms are frequently present two weeks post-injury within the course of typical recovery (Broglio & Puetz, 2008). For most people who suffer a concussion, adequate care leads to full recovery by the end of this acute stage. Unfortunately, despite a good prognosis for the majority of patients with mTBI, there is a portion of the population for whom these symptoms move into a persistent, postacute phase for months, or even years, post-injury (Babcock et al., 2013; Bigler, 2008; Faul et al., 2010; McCrea et al., 2003).

PCS is typically defined as the persistence of three or more post-concussion symptoms that continue for three months or longer after injury (Boake et al., 2005; Faul et al., 2010; McAllister & Arciniegas, 2002). The group of symptoms associated with PCS is similar to those typically seen in the acute stage of concussion, but they present in

constellations unique to each person and persist beyond the expected recovery timeframe (Faul & Coronado, 2015).

Of particular interest to treating SLPs are the cognitive symptoms commonly associated with PCS, as these are the symptoms SLPs are charged with assessing and treating. Although the reported frequency of specific symptoms varies across measurement tools, a review of commonly administered symptom-reporting instruments (i.e., the Post Concussion Symptom Scale, the Rivermead Post Concussion Symptoms Questionnaire, and the Post-Concussion Symptoms Questionnaire) reveals that there is consensus regarding the most commonly reported symptoms. Changes in memory, attention, and processing speed or "fogginess" are the cognitive domains most commonly impacted by PCS as reported on these instruments (Chen, Johnston, Collie, McCrory & Ptito, 2007; Ingebrigsten, Waterloo, Marup-Jensen, Attner, & Romner, 1998; Potter, Leigh, Wade & Fleminger, 2006; Mittenberg & Strauman, 2000). While SLPs are expected to evaluate and treat symptoms across these cognitive domains, it is crucial to understand the other common symptoms of PCS and how they may impact cognitive functioning. For example, posttraumatic stress disorder (PTSD) is often seen in combat veterans who have sustained head injuries, and it has also been shown to negatively impact attention performance (Brandes et al., 2002; Tsai, Whealin, Scott, Harpaz-Rotem & Pietrzak, 2012). PCS is commonly associated with other comorbid psychological symptoms, such as depression and anxiety, as well as comorbid somatic symptoms, such as headache or chronic pain (Silverberg & Iverson, 2011). The interaction among these various impacted domains creates a complex picture of PCS and requires careful

consideration for SLPs or other professionals treating symptoms (Silverberg & Iverson, 2011)

Much like the methodological issues surrounding the definition of mTBI, there are inconsistencies across clinical definitions of PCS. Further, there is a lack of standardization in its diagnosis. For example, a recent study by Voormolen et al. (2018) applied eight measures commonly used to diagnosis PCS to a sample of 700 concussion patients and found that positive diagnoses ranged from roughly 11 to 60% of the group across diagnostic tools. This lack of consensus regarding definition and diagnosis complicate the study of PCS. Further, the diagnosis of PCS relies largely on self-report of symptoms post-injury. There is rarely a baseline for the measurement of neurocognitive functioning, and there is inherent subjectivity in the self-report of symptoms (Kamins & Giza, 2016; Mittenberg & Strauman, 2000; Silverberg & Iverson, 2011).

The research has increasingly shown that there is no single cause of PCS and no single factor that prolongs the symptoms associated with it. Rather, the syndrome arises as a result of the complex and dynamic interaction of pre-injury factors, injury characteristics, and response to injury (Iverson & Lange, 2011; Silverberg & Iverson, 2011; Waljas et al., 2015). These include both neurobiological and psychosocial components of varying severity and level of influence across individuals (Silverberg & Iverson, 2011).

Pre-injury factors that have been associated with PCS include a history of psychological disorders, age (specifically older adults and teens), a history of headaches, and female gender (Bazarian & Atabaki, 2001; Heyer et al., 2016; Lange, Iverson &

Rose, 2011). Although the presence of these factors is linked to prolonged recovery from concussion, their relationship to PCS is complex, and the research is yet emerging. In terms of gender, for example, the literature has long suggested that women are more likely than men to report persistent symptoms, leading to more frequent diagnosis of PCS (Rutherford et al., 1989; Ryan & Warden, 2003). More recent research, however, has shown that physiological factors including hormonal disruption and neck size, rather than behavioral factors, could make women more prone to complicated recovery (Bazarian et al., 2010; Baker et al., 2016). Those who suffer from pre-injury anxiety and depression are also more likely to experience PCS, reporting a greater number and increased severity of persistent psychoemotional symptoms (Lange et al., 2011). Further complicating this factor, research suggests that the changes in neurophysiology due to injury may cause or exacerbate depression in some patients (Lange et al., 2011; Rapoport, McCullagh, Shammi & Feinstein, 2005). This is particularly relevant for cognitive rehabilitation post-concussion, as recent research suggests that depression negatively impacts performance on cognitive testing, which could lead to mischaracterization of cognitive symptoms post-injury (Terry, Brassil, Iverson, Panenka & Silverberg, 2018). As the literature expands regarding predictors of PCS, it is clear that both psychological and physiological pre-injury factors are involved.

There are also several injury-related factors that can be defined within this biopsychosocial framework of PCS. There is some research to suggest that certain neurophysiological profiles of injury may be susceptible to long-term symptoms, but there is not yet consensus regarding these factors (Silverberg & Iverson, 2011). Across the literature, one of the most consistently identified predictors of prolonged recovery is

the presence of multiple symptoms immediately following the injury, particularly when headache or cognitive fatigue and "fogginess" symptoms are reported (Barlow et al., 2010; Heyer et al., 2016; Meehan, Mannix, Monuteaux, Stein & Bachur, 2014). As our understanding of the neuropathology of concussion deepens, new research could expand our understanding of the injury-related factors relevant to PCS.

Additionally, several psychosocial factors related to a patient's response to injury can further influence the onset and duration of PCS (Silverberg & Iverson, 2011; Sullivan, Edmed, Allan, Smith & Karlsson, 2015). As discussed in the literature regarding veterans and mTBI, comorbid posttraumatic stress disorder (PTSD) is associated with impaired cognitive function post-concussion, confounding psychological and neurocognitive factors within the complex framework of PCS (Jackson et al., 2017; Martindale, Morissette, Rowland & Dolan, 2017; Silverberg & Iverson, 2011). Similarly, sleep disturbance is a common post-injury factor with a complex relationship to PCS. Insufficient sleep is associated with PTSD, depression, and anxiety, and it contributes to decreased cognitive performance and processing speed (Fogelberg, Hoffman, Dikmen, Temkin & Bell, 2012; Martindale et al., 2017; Schmidt et al., 2015; Silverberg & Iverson, 2011). Research indicates that sleep disturbances may be caused by or exacerbated by neurological changes due to mTBI (Rao, Bergey, Hill, Efron & McCann, 2011). Further, there is evidence that depression and anxiety surrounding the injury can lead to poor sleep (Fogelberg et al., 2012; Ma et al., 2013; Rao et al., 2011). These and other post-injury factors influence the constellation of symptoms of PCS.

The nature of these complex and interconnected factors has led to recent consideration of a biopsychosocial framework for understanding and managing persistent

neurocognitive, somatic, and psychosocial symptoms (Iverson & Lange, 2011; Wäljas et al., 2015). Previous frameworks for understanding the potential long-term sequelae of mTBI symptoms determine only the presence or absence of PCS and the identification of symptoms (Silverberg & Iverson, 2011; Wäljas, 2015). It has become clear, however, that the symptoms of PCS do not appear in isolation, nor do they recover fully without intervention targeting their multifactorial causes (Kamins & Giza, 2016; Silverberg & Iverson, 2011).

Fortunately, many who suffer from PCS can and do make progress in therapy, which increasingly involves SLPs as an integral part of the care team (Knollman Porter, Constantinidou & Marron, 2014; Sohlberg & Ledbetter, 2016). SLPs are highly trained in the assessment and treatment of functional cognitive communication disorders, and patients with persistent neurocognitive effects post-concussion are seeking SLP services at an increasing rate (Duff, 2009; Knollman Porter et al., 2014).

The role of the SLP in concussion management. Speech language pathologists (SLPs) across both medical and educational settings are increasingly finding themselves on the front lines of concussion care. As evidenced by the appearance of practice recommendations within the past five years, SLPs working with concussion have been encouraged to complete training specific to mTBI and to review the literature to enhance clinical practice (Duff, 2009). In schools, SLPs are part of special education teams who provide services to students with brain injury, serving as experts in speech and language therapy as well as cognitive rehabilitation (Duff, 2002; Duff & Stuck, 2015). In hospitals, clinics, and rehabilitation facilities, SLPs conduct assessment and treatment of cognitive functioning, including attention, memory, executive function, and social

communication (Paul-Brown & Ricker, 2003). Thus, SLPs have clients on their caseloads who are suffering from the complex, persistent neurocognitive effects post-concussion (Gioia et al., 2014; Paul-Brown & Ricker, 2003). SLPs are trained to provide cognitive rehabilitation services, and thus, are often the team members likely to be charged with managing changes in attention, memory and executive functions (ASHA, 2016). More and more clients with PCS seek out—and benefit from—speech pathology services, however, little is known about treatment options and clinical approaches being used by SLPs.

Despite the growing role of practicing SLPs in concussion management, graduate programs in speech language pathology have only recently begun to incorporate concussion-specific coursework and supervised clinical experiences into their training (Duff, 2009; Duff & Stuck, 2015). This training, however, is not universal across programs, and it does not reach the many licensed SLPs who are already working in the field (Duff & Stuck, 2015; Knollman Porter et al., 2014). There are a handful of studies from the past 20 years that describe SLPs' reported lack of training and confidence when working with concussion, but it is unclear whether this continues to hold true in the rapidly changing realm of concussion knowledge and awareness (Duff & Stuck, 2015).

The growing number of people accessing care for persistent concussion effects present with complex neurobiological and psychoemotional symptoms, and they benefit from tailored interdisciplinary management (Gioia et al., 2014; Knollman Porter et al., 2014). Most of the literature about current clinical practices and protocols for managing the cognitive symptoms of concussion, however, has come from the field of neuropsychology and does not necessarily address the specific scope and practice of

speech language pathology (Barwood et al., 2013; Duff, 2009). Few studies have examined the practices of SLPs treating concussion, and this project sought to describe the most recent evolutions of clinical practice. A more complete and current understanding of these current practices could potentially inform recommendations for improved care. The bottom line is that the management of cognitive communication deficits associated with PCS falls squarely within the scope of practice of speech language pathologists, but the literature contains only a limited picture of current clinical practice. SLPs are trained in assessing and treating cognitive communication disorders, but what does this look like for those who are on the front lines of concussion care?

Evidence-based clinical practice. In response to increased public awareness in recent years about the prevalence of concussion, there has been a concerted push to develop and implement guidelines for clinical mTBI management, evidenced primarily in the sports medicine research (Gioia, 2017; Knollman Porter, 2014). However, despite the proliferation of new recommendations for care and our expanding awareness about the potential long-term post-concussion effects, evidence-based guidelines are scarce (Gioia, 2017). The guidelines that do exist are not standardized, and their focus is almost exclusively on short-term post-injury care in the acute stage of concussion and return to sport, work, or school (Dachtyl & Morales, 2017; Gioia, 2015; Knollman-Porter et al., 2014). There are still fewer guidelines for the management of persistent neurocognitive symptoms the population that would be treated by SLPs, and those guidelines that have emerged rely on relatively limited evidence (Knollman Porter et al., 2014; Sohlberg & Ledbetter, 2016).

Current clinical guidelines for concussion care generally contain a combination of the following recommendations:

(1) pre-participation education for those at risk of concussion (e.g., athletes and military service members) to prevent injury and improve identification rates;
(2) neurocognitive baseline testing prior to participation;
(3) immediate concussion screening using multiple measurements, including symptom self-rating scales and objective testing of neurocognitive and psychoemotional functioning;
(4) consultation and collaboration of interdisciplinary experts to establish a comprehensive plan of care;
(5) adequate rest with gradually increasing physical activity before return to sport, work, or school;
(6) ongoing follow-up with a licensed health care provider if symptoms persist;
(7) counseling focused on wellness and diminishing symptoms if subjective symptoms persist; and
(8) academic accommodations for students if school performance is affected post-injury (Collins et al., 2014; Gioia et al., 2014; Giza et al., 2017; Knollman-Porter et al., 2014; Levin & Diaz-Arrastia, 2015; VA, 2015).

These guidelines have been generated based on emerging evidence and expert consensus, and they reflect a shift in thinking about mTBI that acknowledges the complex biopsychosocial nature of its impact. That said, to date, there has been very little research into the efficacy of their implementation (Gioia et al., 2017; Sohlberg & Ledbetter, 2016; Knollman-Porter et al., 2014; Kristman et al., 2014).

Among these recommendations, most are from the sport concussion literature and are not necessarily feasible or applicable outside of a school or athletics framework. For example, most concussions are from falls and MVAs sustained during activities of daily living, making pre-participation education or pre-injury neurocognitive testing implausible. Research has shown that many screening and assessment tools are used, with varying degrees of effectiveness, to evaluate the presence and impact of mTBI (Giza et al., 2017). There is consensus within the literature that using multiple tools increases the sensitivity and accuracy of clinical assessment, but there is no evidence-based consensus surrounding which specific tools are most suited to concussion evaluation (Giza et al., 2017; Knollman Porter et al., 2014). Further limitations include disagreement among researchers about the implementation and outcomes of interdisciplinary care and uncertainty surrounding the use of imaging as a diagnostic tool among many populations (Gioia et al., 2014; Giza et al., 2017; VA, 2015). Even less visible in the research are models for assessing, managing, and preventing persistent neurocognitive, behavioral, and somatic symptoms. Specifically, clinical guidelines for identifying and managing PCS outside of the framework of athletes returning to sport are essentially nonexistent (Giza et al., 2017).

As speech pathologists are increasingly involved in concussion care, there are emerging recommendations for best practices. Notably, the Miami University concussion program, started in 1999 as an interdisciplinary team lead by SLPs, has produced practice recommendations for SLPs and collaborating rehabilitation specialists based on their positive clinical outcomes (Knollman Porter et al., 2014). A descriptive, retrospective analysis of concussion treatment delivered at an outpatient clinic reviewed a range of

intervention options for SLPs to consider when treating persistent symptoms (Sohlberg & Ledbetter, 2016). The limited efficacy research demands further study of these recommendations in order to develop guidelines for SLPs. The following practices specific to SLPs are described in the literature and are recommendations based on expert consensus in the absence of high quality, research-based guidelines:

(1) interdisciplinary collaboration for the assessment, planning, treatment, and academic modifications after concussion (Knollman Porter et al., 2014; Dachtyl & Morales, 2017);
(2) neurocognitive testing post-injury with comparison to baseline functioning (Knollman Porter et al., 2014);
(3) provision of individualized treatment in the presence of persistent cognitive symptoms, focused on (a) direct attention training and/or (b) compensatory strategies for memory, attention, and executive functioning (Knollman Porter et al., 2014; Sohlberg & Ledbetter, 2016); and
(4) referral to a behavioral health specialist and additional neuropsychological testing in the presence of persistent psychosocial symptoms (Knollman Porter et al., 2014; Sohlberg & Ledbetter, 2016).

Research objectives. Despite the limited clinical guidelines for SLPs treating concussion, their growing role in concussion care is growing. This project sought to add to the literature by seeking out SLPs who report working in concussion management to learn about the current state of their training and clinical practice, determine whether their practices align with current guidelines, and potentially, to add to the current recommendations for improved concussion care.

CHAPTER II

METHODS

This project considers the growing role of the SLP in managing the cognitive and communicative impacts of concussion and seeks to learn more about the state of current clinical practice. A survey was sent to SLPs with experience in concussion care across a variety of settings—including hospitals, schools, VA medical centers, community clinics, and rehabilitation facilities. Specifically, the survey aimed to determine the following: (1) whether SLPs are receiving training specific to mTBI, (2) their level of confidence in assessing and treating concussion symptoms, (3) their knowledge and perspectives about PCS, and (4) whether current clinical practices align with the evidence-based guidelines currently available. This chapter addresses the methodology used to create, distribute, and analyze the results of the survey.

Survey construction. The instrument constructed for this project was a 41-question, anonymous web-based survey consisting of a combination of closed and open-ended questions. It was distributed to practicing SLPs and included items pertaining to concussion across the following categories: (1) demographics and background information, (2) level of training and confidence of responding SLPs, (3) respondents' current assessment procedures, (4) current treatment practices, and (5) respondents' knowledge and perspectives regarding the SLP's role in concussion management.

Questions in each of these four categories were constructed in alignment with recommendations from the survey design literature. Specifically, neutral language was used throughout the questionnaire to avoid unintentional bias among responses, and mixed question types—including multiple choice, Likert rating scales, and open-ended—

were incorporated into construction of each section (De Vaus, 2014; Dillman, 2014). The questions were ordered by general topic, aiming for a "conversational" navigation for the respondent (Dillman, 2014). To establish content validity, an expert panel consisting of three clinical researchers in brain injury rehabilitation and youth concussion was consulted for the review and editing of the survey content. A pretest of the survey was then administered to graduate students in speech-language pathology to ensure ease of navigation (Dillman, 2014).

An online version of the survey instrument was built using the Qualtrics Research Core survey platform, which houses research software for constructing, distributing, and analyzing custom surveys (Qualtrics, 2018). Multiple choice, open-ended, and mixed-response question types were created as necessary, and controls were added within the Qualtrics survey to minimize the collection of unusable data. These controls included a feature to terminate the survey response automatically if a respondent provided an answer indicating that they did not meet the inclusion criteria for participation in the study. Additionally, internal logic features were embedded within survey questions in order to eliminate extraneous or irrelevant data from the results. For example, the open-ended question "Please briefly list or describe any guidelines or protocols that you or your facility uses to manage persistent concussion/mTBI cases…" was displayed only to those participants who had already indicated that their employer has established guidelines in place for managing concussion cases.

The survey was pretested by a pilot distribution to six master's level graduate students in speech-language pathology. Each participating student was asked to complete the survey in full and to provide written feedback regarding completion time, spelling and

grammar, functionality of the web-based system, and concerns about ambiguity or uncertainty within specific questions. Changes were made to wording, question order, and presentation features (e.g., presenting one question per page rather than three questions per page) based on this feedback. See Appendix A for a copy of the survey instrument.

Participant inclusion criteria. This project sought to gather information about the perspectives and practices of SLPs who currently work in settings where concussion cases are managed. Therefore, all participants were required to meet the following inclusion criteria as confirmed by the survey:

(1) Hold current ASHA Certification of Clinical Competence (CCC) in speech-language pathology or parallel licensure in the country of practice, and
(2) Have assessed and/or treated at least one concussion case within the past 12 months.

Survey administration. All procedures involved in this project were approved by the Institutional Review Board (IRB) at the University of Oregon prior to the survey administration. A survey distribution list was generated with the assistance of my advisor, McKay Moore Solhberg, PhD, CCC-SLP, an expert in the fields of speech-language pathology and cognitive rehabilitation. She provided two contact lists that were likely to include SLPs who treat concussion cases in their practices. The first was a list of SLPs who provided feedback about therapy tools designed for use in cognitive rehabilitation and had given permission for future contact. The second was a list of SLPs who provided their contact information at a national conference presentation about mTBI. In addition to these contact lists, medical SLPs who host graduate students from the

University of Oregon, as well as alumni of the Communication Disorders and Sciences master's program at the University of Oregon, were included in the distribution list. This resulted in 274 unique email contacts in the U.S. and Canada.

The anonymity of survey respondents was maintained through the Qualtrics platform using the "Anonymous Link" email distribution feature. This option created a single hyperlink to the survey embedded within an email. When respondents followed the link to the survey, their email address was not recorded, nor was it associated with their responses. Through an additional anonymization feature provided by Qualtrics, Internet Protocol (IP) addresses of respondents were not recorded (Qualtrics, 2018).

The survey administration email was sent directly from the Qualtrics survey site, and it included a brief request for participation followed by the anonymized link to the survey. Once directed to the Qualtrics survey, each participant was presented with privacy information, a general summary of the project, and information regarding potential risks and benefits of participation. Survey participation began only after consent was provided. The consent statement can be found in Appendix B. Participants were given 30 days to complete the survey from the time it was received, and two follow-up emails were sent to all potential participants to remind them to complete the survey within the allotted timeframe.

Data collection and analysis. All responses to the survey were recorded by Qualtrics and exported from the survey platform into Microsoft Excel. Quantitative data gathered from closed questions were prepared in Excel for further analysis.

The researcher coded all qualitative data gathered from open-ended questions in line with the basic principles of thematic analysis (Braun & Clarke, 2006; Nowell, Norris, White & Moules, 2017). For questions regarding PCS, numbers 34 and 35 of the survey instrument, responses were mapped to concepts in the existing literature to determine whether they aligned with the current research. Refer to appendix A for the complete survey instrument. The remaining open-ended questions—numbers 9, 13, 16, 20-22, 31, and 41—were analyzed by the following process:

(1) thorough reading and consideration of all responses to each question,

(2) identification of distinct concepts and themes that emerged from each question,

(3) creation of codes, or names, to define each of these themes,

(4) categorization of each response by code(s),

(5) review of themes by the researcher and an external auditor, and

(6) re-coding of a data sample by a second rater with knowledge of speech language pathology practices.

In order to establish inter-rater reliability, the second rater was provided with a sample of the qualitative response data, including three questions and their corresponding responses (14% of all survey variables). The response themes and codes applied by the researcher were discussed briefly with the second rater, who was then asked to review and categorize the responses to all three questions. This resulted in a minimum of 89.8% agreement between raters across all sampled variables, as measured by the Reliability Calculator for 2 Raters (ReCal) software tool (Freelon, 2010). Descriptive statistical

analysis of all responses, including relative frequency and spread, as completed using Excel.

CHAPTER III

RESULTS

A descriptive analysis of the response data produced the results outlined in this chapter. Demographic information is presented, as well as results pertaining to the training, confidence level, clinical practices, and perspectives of responding SLPs.

Return rate. Of the 274 surveys distributed, 77 respondents began the survey yielding an initial 28% return rate. However, 14 of these responses were incomplete and an additional five respondents did not meet the inclusion criteria. This resulted in 60 completed, actionable responses and a final response rate of 22%. According to the survey literature, response rates for web-based survey research vary significantly across survey type and function, and the suggested acceptable rates range from roughly 20 to 75% (Morton et al., 2012; Shih & Fan, 2009). Thus, this study fell within the lower end of the expected range.

Participants. Participants included 60 licensed SLPs (n=60) who had assessed and/or treated a patient or student for symptoms related to a concussion within the past 12 months. Eighty percent (80%) of participants reported that their professional title is speech-language pathologist, 15% reported that they currently serve primarily as faculty or researchers but still treat patients, and 5% reported that they hold directorial or administrative positions (e.g., “Director of Rehabilitation”) while also treating patients. Of the total 60 participants, 52 (87%) identified as female, seven participants (12%) identified as male, and one (2%) preferred not to identify a specific gender. Further descriptive demographic information about the participants is listed in the table below.

Table 1.

Participant demographic data

Participant Data *(n=60)*	Responses (n)	Percentage of respondents (%)
Professional title		
Speech-language pathologist (SLP)	48	80%
Faculty or researcher	9	15%
Directorial position (e.g., DOR)	3	5%
Years of clinical practice experience		
Less than 3	9	15%
3 to 5	15	25%
6 to 10	3	5%
11 to 15	3	5%
16 to 20	9	15%
21 to 30	10	17%
30+	10	17%
Gender		
Female	52	87%
Male	7	12%
Prefer not to answer	1	2%
Location		
Western U.S.	33	55%
Southern U.S.	9	15%
Midwestern U.S.	5	8.%
Northeastern U.S.	6	10%
Canada	7	12%
Community environment		
Urban	30	50%
Suburban	23	38%
Rural	7	12%

Participants were asked to report the type(s) of professional setting that they have practiced in over the past five years. Over 50% of respondents had worked in medical settings—specifically acute care, hospital rehabilitation setting and/or outpatient clinic—

within the past five years. Fewer than 5% of respondents had worked in a community health clinic or sports medicine clinic within the past five years. Participant practice settings are detailed in Table 2, listed by their relative frequency.

Table 2.

Practice setting(s) of responding SLPs over the past five years

Practice setting	Responses (n)	Percentage of respondents (%)
Hospital – acute	34	57%
Outpatient Clinic	32	53%
Hospital – rehabilitation	32	53%
Outpatient Rehab	29	48%
College/University	23	38%
Home health	16	27%
Skilled Nursing Facility	16	27%
Private Practice	14	23%
VA/Military Setting	13	22%
School (K-12)	12	20%
Community Health Clinic	2	3%
Sports Medicine Clinic	1	2%
Other	2	3%

Note. Each participant was able to select more than one setting.

Of responding SLPs, 49 (82%) reported that they have seen at least one concussion case within the past three months, and 67% reported that they see 9+ concussion cases per year.

Training and Confidence. All of the respondents were licensed SLPs who reported treating at least one concussion case within the past year. Of the 60 responding SLPs, 56 (93%) reported that they have received training specific to concussion management, and 4 SLPs (7%) reported that they have not received any specialized

training. The following table (Table 3) details the sources of concussion education for the 45 responding SLPs who provided actionable responses to this question.

Table 3.

Concussion-specific training of responding SLPs

Sources of concussion training	Responses (n)	Percentage of respondents (%)
Continuing education in concussion management *(e.g., online CEUs, conference attendance)*	39	87%
Employer-offered training (on-site)	25	42%
Graduate school coursework	11	24%
Ongoing review of current literature (self-study)	8	18%
Interdisciplinary consultation (including attendance at "Grand Rounds")	5	11%
Undergraduate level coursework	1	2%

Note. Each participant was able to list multiple sources of concussion-specific training.

Participants were asked to provide a self-rating on a 5-point Likert scale (from "not at all prepared" to "extremely prepared") regarding how well they felt that their academic and professional training prepared them to (a) assess and (b) treat cases of persistent concussion effects. This measure is referred to in this paper as "preparedness." Of the 60 participants, 56 provided complete responses to these questions. Responding SLPs were also asked to rate their personal level of confidence in (a) assessing new concussion cases and (b) treating cases of persistent concussion effects. This measure is referred to throughout this paper as "confidence." Table 4 details the responses to questions regarding preparedness and confidence.

Table 4.

Self-rated preparedness and confidence in managing concussion cases

Assessment preparedness	(%)	**Assessment confidence**	(%)
How well do you feel that your academic and professional training has prepared you to conduct a successful assessment when meeting a new patient or student with a primary diagnosis of concussion/mTBI?		*Overall, how confident do you feel in assessing new concussion cases?*	
Extremely well prepared	28%	Extremely confident	23%
Very well prepared	25%	Very confident	53%
Moderately well prepared	25%	Moderately confident	12%
Slightly prepared	5%	Slightly confident	0%
Not prepared at all	5%	Not confident at all	0%
Treatment preparedness	(%)	**Treatment confidence**	(%)
How well do you feel that your training has prepared you to provide adequate treatment for cognitive/communicative impairment specific to patients or students with a primary diagnosis of concussion/mTBI?		*Overall, how confident do you feel in treating persistent concussion symptoms (lasting longer than 4 months post-injury)?*	
Extremely well prepared	27%	Extremely confident	20%
Very well prepared	30%	Very confident	38%
Moderately well prepared	22%	Moderately confident	27%
Slightly prepared	5%	Slightly confident	2%
Not prepared at all	5%	Not confident at all	2%

Assessment procedures. When asked whether their place of employment has an established protocol in place for assessing and managing concussion cases, 27 responding SLPs (45%) responded "yes," and 27 (45%) responded "no." The six remaining respondents (10%) reported that they were "unsure" whether or not their employer had an established protocol in place specific to concussion. Those who reported use of an established protocol were then asked to describe or list its components in an open-ended question. Of the 25 SLPs who wrote in a response to this question, 9 (36%) reported using a formal evidence-based set of guidelines (e.g., Ontario Neurotrauma Foundation Guidelines for Concussion/mTBI; VA/DoD 2016 Clinical Practice Guidelines:

Management of Concussion-mild Traumatic Brain Injury). The practice settings of SLPs who reported use of formal guidelines was varied, and responses included both medical and school settings. Of those who did not report use of formal guidelines, 14 (88%) described use of at least two of the four consensus-based practice recommendations for SLPs treating concussion in their open-ended responses to question 13 (Knollman Porter et al., 2014; Sohlberg & Ledbetter, 2016), with more than half of respondents implementing neurocognitive testing and patient-centered, individualized treatment of persistent symptoms.

Participants were asked five questions regarding their assessment practices. First, they were asked whether there were any standardized assessment tools that they typically used to evaluate new concussion cases, and 52 respondents (87%) responded "yes." Twenty-three respondents (42%) reported that they typically assess a concussion client two or more times over the course of recovery using standardized measures. Next, they were asked to list up to 4 formal assessment measures that they use most frequently with new concussion cases. The table below includes a list of assessment protocols by relative frequency of use. Among the 60 responding SLPs, 42 separate assessments were identified.

Participants were also asked in an open-ended question to list any informal assessment measures that they commonly use to evaluate new concussion cases. Of the 60 respondents, 51 (85%) provided an analyzable response to this question. Ten unique informal evaluation methods were identified from their responses, and these are detailed in Table 6 by relative frequency.

Table 5.

Most popular formal assessments by percentage (%) of SLPs reporting their use

Formal Assessment Measure	Responses (n)	Percentage of respondents (%)
Repeatable Battery for the Assessment of Neuropsychological Status (RBANS)	17	36%
Functional Assessment of Verbal Reasoning and Executive Strategies (FAVRES)	15	32%
Cognitive Linguistic Quick Test (CLQT)	12	26%
Woodcock-Johnson (WJIV)	10	21%
Test of Everyday Attention (TEA)	7	15%
Behavior Rating Inventory of Executive Function (BRIEF)	7	15%
Rivermead Behavioral Memory Test (RBMT)	6	13%
Controlled Oral Word Association Test- FAS (Oral FAS)	6	13%
Sports Concussion Assessment Tool (SCAT)	5	11%
La Trobe Communication Questionnaire (LCQ)	5	11%
Ross Information Processing Assessment (RIPA)	4	9%
Rey Auditory Verbal Learning Test (RAVLT)	4	9%
Attention Process Training Test (APT-TEST)	3	6%
King-Devick Test	3	6%
Trail Making Test Part A and B	3	6%
Montreal Cognitive Assessment (MoCA)	3	6%
St. Louis University Mental Status (SLUMS)	3	6%
Adverse Childhood Experiences (ACEs)	3	6%
Behavioural Assessment of Dysexecutive Syndrome (BADS)	2	4%
Learning and Study Strategies Inventory (LASSI)	2	4%
Assessments used by < 3% of responding SLPs		<3%

Neuropsychological Assessment Battery (NAB), Assessment of Language-Related Functional Activities (ALFA), Paced Auditory Serial Addition Test (PASAT), California Verbal Learning Test (CVLT), Pediatric Test of Brain Injury (PTBI), Party-Planning Task, Orientation-Log (OLOG), Measure of Cognitive Linguistic Abilities (MCLA), Weschler Memory Scale (WMS), Connors, (WAIS), Western Aphasia Battery (WAB), ImPACT, Test of Adolescent/Adult Word Finding (TAWF), Mayo Portland Adaptability Inventory (MPAI), Self-Awareness Deficit Interview (SADI), Speed and Capacity of Language Processing (SCOLP), Symbol Digit Modalities Test (SDMT), Scales of Cognitive and Communicative Abilities for Neurorehabilitation (SCCAN), Durham, Cognitive Skills Index (CSI)

Note. Each participant was able to list up to four commonly used assessments.

Table 6.

Informal assessment methods used by responding SLPs

Informal assessment tool	Responses (n)	Percentage of respondents (%)
Interview with client and family	32	63%
Symptom checklists, questionnaires, or self-rating scales	20	39%
Informal cognitive tasks of memory, attention, and/or executive functioning	10	20%
Clinical observation of strategy use, strengths, symptoms	8	16%
Informal speech/language sample or discourse analysis	6	12%
Non-standardized reading and/or writing tasks	4	8%
Modified portions/subtests of formal assessments	4	8%
Collaborative goal-setting	3	6%
I do not use informal assessment methods when evaluating new concussion cases	3	6%
Informal pragmatics observation	2	4%
Hearing screening	1	2%
Other/Unrelated response	8	16%
Total question responses	51	---

Participants were asked to identify the professionals within their work setting who are most commonly involved in concussion care, as well as the most frequent primary care provider for concussion care. Of responding SLPs, 75% reported that SLPs are an active team member in concussion management at their place of employment, and 25% reported that the SLP is typically the primary care provider for persistent concussion cases.

Participants were also asked about the referral process for assessment of PCS. Specifically, they were asked to identify from a list the most frequent sources (up to four) from whom they most frequently receive referrals, as well as the most frequent

professionals (up to four) to whom they refer concussion cases for additional assessment or treatment. The responses to these questions are outlined in Table 7 below.

Table 7.

Most common referral pathways for SLPs and PCS

SLPs most frequently refer *to*...	Responses (n)	(%) of responses	**SLPs most frequently receive referrals *from*...**	Responses (n)	(%) of responses
Neuropsychologist	24	40%	Physician	44	73%
Ophthalmologist or optometrist	23	38%	Physical therapist	13	22%
Psychologist or counselor	19	32%	Neuropsychologist	12	20%
Physical therapist	18	30%	Occupational therapist	9	15%
Occupational therapist	16	27%	Nurse	6	10%
Physician	9	15%	Psychiatrist	4	7%
Psychiatrist	3	5%	Psychologist or counselor	3	5%
SLP	2	3%	Classroom teacher	2	3%
Classroom teacher	1	2%	Athletic trainer	2	3%
Nurse	1	2%	Special education teacher	0	0%
Special education teacher	1	2%	Ophthalmologist or optometrist	0	0%
Athletic trainer	0	0%	Other	3	5%
Other	3	5%			
I do not typically refer cases to other professionals	4	7%			

Treatment practices. Participants were asked to identify which persistent cognitive communicative symptoms they target most often with concussion clients, and they were also asked to identify their most frequently used intervention approaches for concussion management. Tables 8 and 9 include response data for these questions.

Table 8.

Most frequently targeted cognitive communication symptoms of PCS

Symptom	Responses	(%)
Memory challenges	43	23%
Attention or concentration deficit	45	24%
Disorganization	34	18%
Impaired judgement or self-control	11	6%
Reading or writing impairment	11	6%
Speech or language impairment	6	3%
Social communication	5	3%
Comorbid somatic symptoms (e.g., headaches)	15	8%
Comorbid emotional symptoms (e.g., depression)	9	5%
I have not treated persistent cognitive/communicative symptoms related to concussion	0	0%
Other	8	4%

Table 9.

Most frequently used intervention approaches

Intervention type	Responses	(%)
Cognitive/metacognitive strategy training (e.g., strategies for self-monitoring behavior, making a to-do list, self-talk, etc.)	46	87%
Training of assistive devices (e.g., smartphone app as a memory aid)	28	53%
Psychoeducation (e.g., educating patient about concussion, promoting symptom tracking)	26	49%
Computerized neurocognitive training or treatment (e.g., computerized attention training program)	8	15%
Reading or writing instruction	4	8%
Small group therapy	4	8%
Psychosocial counseling	3	6%
Other	2	4%

Participants were asked to identify the professionals involved in concussion care at their place of employment from a list of 12 professionals and an option to write in additional responses (e.g., physician, nurse, physical therapist, athletic trainer). Of the 53

respondents who answered this question, 87% identified three or more professionals involved in concussion care. Participants most frequently identified physicians (75%), SLPs (75%), physical therapists (60%), occupational therapists (50%), and neuropsychologists (47%) as the professionals commonly involved in concussion care.

Knowledge and perspectives. Participants were asked eight questions about their experience with and perspectives on persistent concussion effects in the clinical setting. Approximately 68% of responding SLPs reported persistent concussion symptoms in at least half of the cases they see. Twenty percent (20%) of respondents reported that they exclusively see concussion cases in which the client is experiencing PCS. Participants were then asked to identify the symptoms of PCS that they most commonly encounter, as well as the symptoms that they most commonly address in treatment with a client who has PCS. Their responses are outlined in Tables 10 and 11 below.

Table 10.

PCS symptoms most often encountered by SLPs

SLPs most often *see* these PCS symptoms:	Responses (n)	Percentage of responses (%)
Memory challenges	45	22%
Attention or concentration deficit	44	21%
Comorbid somatic symptoms (e.g., headaches)	40	19%
Disorganization	30	14%
Comorbid emotional symptoms (e.g., depression)	30	14%
Social communication	8	4%
Impaired judgement or self-control	7	3%
Speech or language impairment	4	2%
Reading or writing impairment	1	0%

Note. Respondents were able to select up to four (4) symptoms.

Table 11.

PCS symptoms most often addressed in SLP treatment

SLPs most often *treat:*	Responses (n)	Percentage of responses (%)
Attention or concentration deficit	45	24%
Memory challenges	43	23%
Disorganization	34	18%
Comorbid somatic symptoms (e.g., headaches)	15	8%
Impaired judgement or self-control	11	6%
Reading or writing impairment	11	6%
Comorbid emotional symptoms (e.g., depression)	9	5%
Other	8	4%
Speech or language impairment	6	3%
Social communication	5	3%

Note. Respondents were able to select up to four (4) symptoms.

Participants were then asked, in an open-ended format, to list or describe any factors that they believe lead to either a quick recovery or a prolonged recovery from concussion. Their responses to these questions are detailed further in Tables 12 and 13 below.

Responses were divided into pre-injury factors, injury-related factors, and post-injury factors, as well as "co-morbid conditions" to account for responses that referred to the effects of psychological or somatic symptoms on PCS but did not specify the onset of these symptoms.

Participants were asked whether there were any additional resources not currently available to them that would make them better prepared for managing concussion cases. Of the 56 SLPs who responded, 30 (54%) responded "yes," that they would benefit from

Table 12.

Factors leading to quick recovery (<10 days) from concussion

Factors leading to quick recovery:	Responses (n)	Percentage of responses (%)
Sufficient post-injury rest	12	28%
Pre-injury baseline (physical & psychological health, age, education level)	12	28%
Immediate diagnosis & high-quality care	11	25%
Good patient education about concussion and expected recovery	9	21%
Injury factors (severity, location of impact, type/cause of impact)	7	16%
Positive family and/or social supports	7	16%
First concussion (No history of head injury or neurologic impairment)	6	14%
Personality factors and/or motivation level	4	9%
Emphasis on wellness and recovery	4	9%
Nutrition and/or hydration	3	7%
Early management of visual or vestibular symptoms (e.g., limiting screen use)	3	7%
Other*	6	14%
Unsure / Cannot answer	5	12%

**Relevant responses marked as "other" included:(1) chiropractic care for neck involvement, (2) immediate environmental adaption to reduce symptoms*

additional resources. Those who responded “yes” were asked to list or describe these resources in an open-ended format. Of these 30 respondents, 26 wrote in a response, and these are detailed in Table 14 below.

They were also asked to provide their opinion as to whether SLPs have any training or knowledge to make them uniquely qualified to manage cases of persistent concussion symptoms. Thirty-nine respondents (65%) reported that they believe SLPs have unique qualifications for concussion care, 3 respondents (5%) reported that they do

Table 13.

Factors leading to prolonged recovery from concussion.

Factors leading to prolonged recovery (PCS)	Responses (n)	Percentage of respondents (%)
Pre-injury factors	*35*	*73%*
Pre-existing mental health disorder (e.g., depression, anxiety)	*19*	*40%*
History of head injury or neurologic impairment	*13*	*27%*
History of drug and alcohol abuse	*7*	*15%*
History of learning disability or cognitive impairment	*7*	*15%*
History of migraines	*5*	*10%*
Education level	*4*	*8%*
Age (teens, aging adults)	*3*	*6%*
Gender	*3*	*6%*
Co-morbid conditions	*29*	*60%*
Psychological (e.g., PTSD, depression)	*25*	*52%*
Physical (e.g., chronic pain)	*6*	*13%*
Injury-related factors	2	4%
Multiple symptoms at time of injury	*1*	*2%*
Type of concussion	*1*	*2%*
Post-injury factors	*24*	*50%*
Inadequate treatment post-injury	*9*	*19%*
Poor support system	*8*	*17%*
Added psychosocial stressors (e.g., financial/work)	*5*	*10%*
Low motivation	*4*	*8%*
Sleep disturbance	*3*	*6%*
Inadequate recovery time (return to work/play too quickly)	*3*	*6%*
Personal response to injury (e.g., low motivation, type "A," low self-awareness)	*10*	*21%*
Litigation surrounding injury	*4*	*8%*
Other factors (identified by only one respondent each): *Vision changes, socioeconomic status, blast exposure, being homeschooled, exposure to screens*		

not believe that SLPs have unique qualifications, and 11 (18%) stated that they were unsure. Those who believed that SLPs have unique qualifications were then asked to briefly list or describe them. Of the 34 respondents to this question, two reported that

SLPs have unique qualifications if they have received additional specialized training in concussion. Table 15 further details the responses.

Table 14.

Additional resources desired by SLPs

Additional resources	Responses (n)	Percentage of responses (%)
Additional or updated assessment and treatment materials	15	58%
More options for continuing education regarding concussion	6	23%
Standardized protocol for managing concussion	6	23%
Improved or increased interdisciplinary management of concussion	5	19%
More sensitive assessment and/or treatment materials for high functioning patients	3	12%
Other*	4	15%

**Relevant responses marked "other" included: (1) dysphagia resources specific to mTBI, (2) increased access to neuroimaging, (3) access to vestibular testing, and (4) increased treatment time*

Table 15.

Factors that make SLPs uniquely qualified to manage concussion.

Skills, expertise, or training	Responses (n)	Percentage of responses (%)
Understanding of the interaction between cognition and communication	22	65%
Expertise in assessing and treating cognitive disorders	18	53%
Counseling skills and/or therapeutic approach	10	29%
Knowledge of compensatory/metacognitive strategy techniques	7	21%
Knowledge of neuroanatomy	5	15%
Accessibility (e.g., can spend more time with a patient or student than an MD)	5	15%
Other skills/expertise	4	12%
Only with additional training	2	6%

CHAPTER IV

DISCUSSION

Survey responses were gathered from an intentionally focused sample of SLPs working in concussion management in order to better understand their knowledge and practices. This section summarizes trends in the findings in the hopes of identifying strengths in current clinical practice, as well as areas of need. Overall, the findings indicated a high level of confidence in concussion care practices, strong knowledge and awareness of complex PCS factors, and improving assessment procedures for identifying concussion effects. Findings also identified the need for more sensitive assessment materials appropriate for evaluating concussion effects, as well as a need for increased availability of concussion-specific training for SLPs.

Training and confidence. Findings showed that, generally, SLPs who work in concussion care feel quite confident in their training and knowledge about best practices. This was unanticipated given how recently concussion has become a primary disorder on SLP caseloads. Of responding SLPs, a somewhat surprising 93% had received training specific to concussion, and 76% reported feeling "very" or "extremely confident" in their assessment of concussion cases. As previous studies have indicated that SLPs do not feel confident in their skills or certain about their role in treating concussion (Duff & Stuck, 2015), this result potentially reflects a shift toward more effective training and increased clinical confidence.

A somewhat surprising 67% of participants reported seeing at least nine concussion cases per year, but there was no significant correlation between increased number of concussion cases and increased confidence. Worth noting, however, is that

four of the seven SLPs who reported feeling “not at all confident” or “slightly confident” were within the 33% of respondents who reported seeing less than 9 concussion cases per year. Additionally, six of the seven responses indicating low confidence in assessment or treatment of concussion were reported by SLPs who have been practicing for 16+ years. Given the small sample size, it is difficult to make meaningful generalizations from these responses. However, the majority of participants across all experience levels reported feeling confident, and the few respondents who do not feel confident are those who have been practicing the longest. This could be suggestive of the growing role of the SLP in concussion care and a positive shift in clinical confidence and preparedness over the past decade.

Certainly, this positive shift needs to be interpreted within the possible bias of the sample. Because the survey was restricted to individuals who treated concussion, there would be an expected increase in training and confidence over speech pathologists who are not in practice settings where they have treated this population. It is also possible that responses were skewed toward high confidence based on question structure, given that internal consistency reliability was not established for the 5-point Likert-type scales used to measure confidence and preparedness (Leung, 2011; Norman, 2010).

Although SLPs reported feeling confident in their training, that training largely comprises continuing education sought out by those specifically interested in TBI. A surprising 87% of respondents reported that they have completed continuing education opportunities specific to concussion. This indicates that the responding SLPs are highly motivated to improve their knowledge and practices surrounding concussion, but it also suggests that graduate level training lags behind the growing need for skills related to

concussion management. Only 11 SLPs reported that they received training specific to concussion management in their graduate training program, and 10 of those 11 SLPs graduated within the past five years. Because concussion-specific training is becoming more common—although not yet standardized—across graduate training programs (Duff & Struck, 2015; Knollman Porter, 2018), it is not surprising that SLPs who graduated more recently were more likely to report that they received graduate level coursework specific to concussion. That said, 14 (58%) of the 24 respondents who graduated within the past five years did *not* report graduate level coursework or clinical training in concussion. These findings are promising in that younger clinicians are receiving more concussion training as a part of their clinical masters' degree programs. However, these findings also suggest that more than half of recent graduates have not received concussion training as part of their graduate program. It seems likely that the recent advancements in concussion research are gradually finding their way into graduate training programs, but there is still a need for growth in this area in order to better equip clinicians for their role in concussion care.

Assessment procedures. As discussed, current evidence-based guidelines recommend using standardized measures as part of an assessment battery for evaluating cognitive communication changes, particularly in cases of persistent symptoms. However, there is currently no consensus in the literature regarding which specific assessments are most effective for identifying and describing the typically subtle neurocognitive symptoms caused by concussion, and still fewer recommendations regarding assessments for identifying PCS (Giza et al., 2017; Knollman Porter et al., 2014; Voormolen et al., 2018).

Responding SLPs reported use of 42 different standardized assessments, ranging from bedside cognitive screeners (e.g., the Montreal Cognitive Assessment [MoCA; Nasreddine et al., 2005]) to a screening battery sampling multiple cognitive domains (e.g., Repeatable Battery for the Assessment of Neuropsychological Status [RBANS; Randolph, 2012]). This wide range of assessments was somewhat unexpected. Certainly some variation could be explained by setting and individual client needs. For example, an SLP in a high school would be more likely to administer the Sport Concussion Assessment Tool to a student athlete [SCAT3] (Davis et al., 2017) than an SLP working with older adults. However, many of the reported assessment measures have overlapping functions and indications.

Of the 42 identified assessment tools, the most frequently reported was the RBANS, which is used regularly by 36% of respondents. The RBANS is a screening measure that surveys a range of neurocognitive domains (e.g., immediate memory, visuospatial ability, language, attention, and delayed memory), and it has high psychometric properties (McKay et al., 2007). Although it was originally developed for assessment of individuals with dementia, it has been increasingly used to identify the cognitive effects of TBI (McKay et al., 2007). It specifically addresses attention and memory deficits commonly associated with concussion, and at least two studies have found emerging evidence that the RBANS is sensitive to the effects of mTBI, making it a reasonable choice for SLPs looking to assess cognitive effects of concussion (Moser & Schatz, 2002; McKay et al., 2008).

The number of different assessments currently in use likely points to both the lack of evidence-based recommendations for standardized assessment tools and also to a lack

of instruments sensitive to mild cognitive impairments (Register-Mihalik et al., 2013). The often subtle cognitive impairments seen in concussion cases, particularly in attention and working memory, require use of instruments that are sensitive to these domains. The reported use of instruments such as the RBANS, the Test of Everyday Attention [TEA] (Robertson et al., 1994), and the Trail Making Test (Reitan, 1992)—each of which is designed to evaluate cognitive domains commonly impacted by mTBI—potentially indicates recent improvement in SLP assessment procedures for concussion cases. Duff et al. (2002), in a survey of SLP assessment practices, found that two of the three most common assessments used in concussion cases at that time were aphasia batteries. The researchers reported that the tools in use by SLPs at the time did not have the sensitivity or specificity to detect the subtle cognitive deficits caused by mTBI and were not appropriate for this purpose (Duff et al., 2002). The results of the present survey, however, showed that SLPs may be selecting a wider range of measures with greater sensitivity and specificity for identifying issues in attention and memory—as opposed to cognitive and linguistic deficits associated with aphasia.

Since the publication of the Duff et al. study in 2002, several tools specific to concussion have appeared, such as the King-Devick test, which is sensitive to oculomotor changes and attention deficits in student athletes (Galetta et al., 2011), and the Immediate Post-concussion Assessment and Cognitive Testing (ImPACT), a neurocognitive screener intended to evaluate immediate cognitive status as well as memory, attention, and language post-injury (Schatz, Pardini, Lovell, Collins, & Podell, 2006). It is somewhat surprising, therefore, that only three SLPs (6.4%) reported use of the King-Devick test, and only one SLP reported use of the ImPACT assessment.

Despite the expanded repertoire of tests in use, however, not all reported measures are sensitive to the domains impacted by concussion. The frequent use of the Functional Assessment of Verbal Reasoning and Executive Strategies [FAVRES] (MacDonald, 2016), the second most commonly reported assessment (32%), for example, was somewhat unexpected. This is a measure designed to evaluate primarily executive functioning, discourse, and verbal reasoning abilities (MacDonald, 2016; MacDonald & Johnson, 2005), domains less commonly associated with concussion symptoms than attention and memory. Although a preliminary study showed that some subtests of the FAVRES may be sensitive to processing speed changes after mTBI (Parrish et al., 2009), the high frequency of its use among responding SLPs was surprising. Similarly, use of other cognitive screening tools, such as the Cognitive Linguistic Quick Test (CLQT; Helm-Estabrooks, 2001), reported by 26% of respondents, and the MoCA, reported by 6% of respondents, was unexpected, as these instruments would not be expected to identify the typically mild cognitive symptoms associated with concussion. Both the MoCA and the CLQT are intended for screening adults with neurocognitive deficits due to stroke, dementia, traumatic brain injury, and other neurological disorders, rather than evaluation of the mild cognitive changes that typically occur with concussion (MacDonald, 2016; Helm-Estabrooks, 2001). An examination of the assessment tools endorsed by the 67% of clinicians who reported treating nine or more concussions per year did not yield any significant correlation or preferred neurocognitive testing instruments. However, 12 of the 14 clinicians who reported frequent use of the MoCA, CLQT or the St. Louis University Mental Status Exam [SLUMS] (Morley & Tumosa, 2002) were within the 33% of clinicians who reported seeing less than 9 concussions per

year. This suggests that those clinicians who are most experienced in concussion assessment are perhaps less likely to use these dementia screeners than tools more appropriate for detecting mild cognitive deficits typically seen in concussion cases.

While the results of this survey suggest a positive shift over the past 15 years toward the use of a more appropriate range of assessment tools by SLPs, they also suggest that there is a need for more instruments, or easier access to instruments, that are appropriate for evaluating the mild cognitive symptoms seen in concussion cases. It is worth noting that the responding SLPs are aware of the issues surrounding assessment of cognitive function post-concussion and echoed this in their responses. When asked an open-ended question about what resources would improve their confidence and ability in managing concussion cases, 58% reported that they need additional or updated assessment materials. Twenty-three percent (23%) reported a need for standardization and 12% of respondents specifically addressed the need for materials that are more sensitive to high functioning concussion patients.

Despite the fact that respondents identified 42 common assessment measures and more than half of responding SLPs reported the need for improved assessment materials in order to improve their concussion care practice, 76% of respondents reported high levels of confidence in their assessment procedures. This may suggest overconfidence in current practices. It may also suggest that SLPs are relying more heavily on informal measures, such as motivational interviewing, non-validated questionnaires, and clinical observation in the absence of appropriate standardized assessment tools. Without further investigation into assessment procedures, it is not possible to determine whether or not respondents' high level of confidence in their assessment procedures is warranted.

Treatment practices. Despite the recent surge in concussion research, there is surprisingly little evidence regarding the efficacy of specific treatment practices in managing persistent cognitive symptoms post-concussion. For SLPs treating the subset of concussion patients who experience PCS, there are even fewer studies to guide practice. Sohlberg & Ledbetter (2016), in a descriptive retrospective study of 24 cases of PCS, described four treatment approaches delivered by SLPs that have potential to manage persistent cognitive symptoms following concussion. These included: (1) direct attention training paired with strategy training, (2) metacognitive strategy implementation, (3) psychoeducation regarding concussion and recovery expectations, and (4) training of external aids for symptom management (e.g., smartphone calendar feature). Each of these was found to be effective when individualized to the client's specific needs (Sohlberg & Ledbetter, 2016). However, these assertions should be interpreted with caution given the low level of evidence provided by a case description. The survey study aimed to gather information about what treatment approaches SLPs are using to help their clients manage cognitive symptoms. Clinicians could select from a list of 7 treatment approaches, including the four described by Sohlberg & Ledbetter (2016) and 3 identified in clinical guidelines for concussion care (e.g., reading and writing instruction for student athletes returning to school and sport; Gioia et al., 2015). Respondents also had the option to write in any additional approaches that they typically use to treat concussion symptoms. Generally, responding SLPs' treatment practices aligned with these recommended treatment approaches. Of those who responded to the question, 87% reported metacognitive strategy training, 53% reported training assistive devices to manage symptoms, and 49% reported providing psychoeducation to their

clients. Of note, in response to the open-ended question about the unique strengths of SLPs for managing concussion, seven SLPs responded that knowledge of compensatory cognitive strategies is a unique strength or area of expertise for SLPs, which appears to align with their treatment practices. Additionally, responding SLPs reported that memory and attention deficits are the most frequently targeted cognitive domains in clients with PCS, which aligns with what the research indicates are the two most frequently reported cognitive symptoms post-concussion (Chen et al., 2007). The small sample size and the scarce research regarding best treatment practices make generalizations difficult, but these results suggest that many SLPs are implementing metacognitive strategy training to address impairments in attention and memory, which aligns with current recommendations.

As the current clinical recommendations for SLPs in concussion care include interdisciplinary consultation and collaboration, this study included three questions about concussion care teams and referral pathways (Knollman Porter et al., 2014). When asked to identify which professionals are commonly involved in concussion care, 87% identified at least three separate professionals, which suggests that SLPs are working in consultation or collaboration with other disciplines to provide services. Although the response to this question does not provide insight into the nature of participants' professional collaboration with these other providers, it does suggest that SLPs are engaged in interdisciplinary care, which aligns with current recommendations.

Of particular interest to this study, clinical recommendations specific to SLPs include referral to neuropsychology and behavioral health in the presence of persistent psychosocial symptoms (Knollman Porter et al., 2014; Sohlberg & Ledbetter, 2016).

Participants were asked to identify up to four professionals they most commonly refer concussion clients to during the course of care, and respondents indicated that they most frequently refer to neuropsychology (40%), ophthalmologist or optometrist (38%), and psychology or counseling (32%). Only four respondents (7%) indicated that they do not typically refer concussion cases to other professionals. SLPs reported most frequently *receiving* referrals from physicians (73%), followed by physical therapists (22%), neuropsychologists (20%), and occupational therapist (15%). This suggests that SLPs are making referrals in alignment with current recommendations. Additionally, the high number of SLP referrals to ophthalmology aligns with emerging research about the impact of mTBI on visual and oculomotor functioning (Murray et al., 2014).

Knowledge and perspectives. As expected based on the PCS research and the SLP's scope of practice, the majority of responding SLPs (68%) treat symptoms of PCS in more than half of their concussion cases. A full 20% of participants reported that they *exclusively* see cases of PCS. This finding speaks to the necessity of the SLP's knowledge of the multifactorial components of PCS, and it also suggests that this sample of SLPs is more experienced in with PCS than the wider population of SLPs.

To understand SLP knowledge of PCS, participants were asked two open-ended questions: (1) In your professional experience, are there any factors that you have found to make a particular patient or student more prone to long-term concussion symptoms? Please list briefly; and (2) Are there any factors that lead to a quick recovery (<10 days) for a patient or student who has suffered a concussion/mTBI? Please list briefly. Of responding SLPs, 73% identified at least one pre-injury factor that leads to PCS, 60% identified co-morbid conditions such as PTSD or chronic pain, and 50% identified at least

one response to injury factor. Overall, the pre- and co-morbidities identified in the survey align with the research. SLPs discussed PTSD, depression, anxiety, sleep disturbance, age, gender, history of headaches, and history of head injury as factors that increase the risk for PCS. This suggests that this sample of SLPs is familiar with the current literature and understands the complexity of the interacting biopsychosocial factors that lead to persistent effects following concussion (Iverson & Lange, 2011; Wäljas et al., 2015; Silverberg & Iverson, 2011). That said, only seven (16%) of respondents reported that they find the nature of the injury (e.g., severity, location, loss of consciousness) contributes to a quick recovery, and only two SLPs (4%) mentioned injury-related factors that contribute to PCS. The research suggests that injury-related factors, such as the presence of multiple symptoms at the time of injury, are part of the complex constellation of PCS factors, and I would have expected more SLPs to reflect this in their report (Silverberg & Iversion, 2011; Heyer et al., 2016).

Limitations. The primary limitation of this project is the small sample size (n=60). However, despite the small sample and the relatively low rate of response, the result was a more focused sample given the restriction to only those SLPs who reported treating concussion cases. Presumably, if we understand the knowledge and practices of those who are actively treating concussion, we will gain insight into the people and factors that will be directing the field in the future. Email distribution also provided a targeted distribution and a more controlled survey environment than social media or listerv distribution which helped to mitigate the lower response rate. Considering the relative newness of concussion management on SLP caseloads and the lack of

information about assessment and treatment practices, it is valuable to understand the perspectives and experiences of 60 people who are actively providing care.

Although this focused sample provides insight into the knowledge and practices of SLPs treating the concussion population, the relative uniformity of participants introduces bias. In part, this targeted sample supported the research objectives of the project by providing information from SLPs with an active interest and engagement in the treatment of concussion. That said, the sample is somewhat skewed and not wholly representative of all SLPs who are currently working with the target population. First, 15% of the respondents were faculty or researchers. Second, roughly one third of the contact list was provided by the University of Oregon Communication Disorders & Sciences program and included program alumni. Most graduates of this master's level SLP training program receive supervised clinical training in acquired brain injury and concussion in a specialty university clinic. Thus, although 24% of respondents reported graduate level training in concussion, this is likely a skewed response, and the actual percentage of SLPs who receive graduate level training in concussion is potentially much lower. The sample is, however, representative of (1) SLPs who voluntarily self-reported their knowledge and perspectives about concussion and (2) SLPs who were accessed through university contact lists. Future research gathering responses from a larger, more diverse sample size of SLPs who treat concussion could provide more representative data.

One of the more surprising findings from the survey was the high level of confidence reported by participants. While this suggests a positive shift from the Duff (2002) study that reported low confidence among SLPs treating concussion, the present

survey did not address clinical competence pertaining to concussion care. Questions targeting specific concussion knowledge could potentially determine whether confidence correlates to knowledge in future surveys. In the Duff & Stuck (2015) survey examining the concussion knowledge and practices of school-based SLPs, general knowledge questions were embedded within the survey instrument. In future concussion research, this method could provide a model for better understanding the clinical competence of SLPs who work with persistent concussion effects.

Other limitations included somewhat limited validation methods of the survey. Face validity was established through a pilot test with a small participant group of graduate students, and a review of the survey instrument by experts in the field established content validity of the question items. Procedures for ensuring construct validity, however, were conducted informally. Additionally, only one external rater was consulted to establish inter-rater reliability among the open-ended responses, and only 14% of the qualitative response data was re-coded for the reliability calculation. Best practices recommend a more formalized process for establishing validity and reliability of a survey instrument (Artino et al., 2014).

Future directions. Despite the ever-growing body of concussion research and continued public interest in the topic, the literature lacks effective evidence-based guidelines for managing PCS. Its etiology and prevalence have received much attention, but those who are actively treating PCS on the front lines have limited research to guide their practices. SLPs are increasingly part of care teams who assess and treat these cases, and the findings of this survey suggest that they are seeking out training specific to concussion. The findings also suggest that SLPs are knowledgeable about current

practice recommendations and are implementing these features into their practices. What will benefit SLPs who work in concussion, and what will ultimately best serve those who suffer from PCS, is continued research into the efficacy of treatment practices, standardization of assessment protocols, and improved training to address the complex nature of persistent concussion effects.

The results of this project suggest that further examination of the current graduate level coursework available to student clinicians is needed. Due to the increasing demand for SLPs in concussion care, a move toward expanding available coursework would benefit the field. Additionally, despite increased use of more sensitive and effective standardized assessments, SLPs are using a wide range of assessments to identify PCS symptoms. Further research into which existing assessments are most effective in the identification of cognitive deficits post-concussion would better guide assessment procedures and increase consistency across clinical practice.

Conclusion. Given the paucity of evidence-based clinical recommendations for SLPs working in concussion and the limited information available about the state of current clinical practice, continued research is needed to ensure the provision of high-quality concussion rehabilitation. This study sought to explore the current practices and perspectives of SLPs who work in concussion and to determine whether their work aligns with clinical recommendations.

SLPs are increasingly seeing concussion cases on their caseloads, and the survey findings suggest that SLPs are working primarily with the effects of PCS. Overall, SLPs report a high level of confidence in their training and practices, a positive shift from earlier studies. The majority of respondents have sought out and completed concussion-

specific training, and their reported practices generally align with current clinical recommendations. While additional research is warranted, the results of this survey are reflective of the increasing awareness of concussion and the growing role of the SLP in concussion management. The results also point to a need for standardization and greater availability of concussion-specific training as the role of the SLP expands.

APPENDIX A

SURVEY INSTRUMENT

1: What is your professional title? *[Open-ended]*

2: Where are you located?

[Multiple choice: List of U.S. States, Canada, Australia, and Other]

3: Which best describes the setting of your workplace?

Rural
Suburban
Urban

4: How many years of experience do you have as a practicing SLP?

5: Which gender do you most closely identify with?

male
female
not listed:_____
prefer not to disclose

6: Over the past 5 years, in which setting(s) have you provided services? Check all that apply.

Hospital - acute	Outpatient clinic
College/university	Hospital - rehabilitation
Public health department	Skilled nursing facility
VA/Military setting	Private Practice
Community outpatient clinic	Home health
School (K-12)	Other:_____

7: In which setting(s) do you *currently* work?

Hospital - acute	Outpatient clinic
College/university	Hospital - rehabilitation
Public health department	Skilled nursing facility
VA/Military setting	Private Practice
Community outpatient clinic	Home health
School (K-12)	Other:_____

8: When did you most recently assess or treat a patient or student with a primary diagnosis of concussion/mTBI?

<3 months ago
3-6 months ago
7-11 months ago
12+ months ago

9: On average, how many new concussion cases do you encounter in a 3-month period?

[Open-ended]

10: Over the course of assessment and treatment, how many times do you typically see a patient or student who is referred to you for concussion management?

1
2-3
4-5
6-7
8+

11: What is the most common cause of concussion in the cases that you encounter?

Sports-related injury
Motor Vehicle Accident
Falls
Combat-related
Other:_____

12: Does your place of work have a protocol in place specifically for management of concussion/mTBI?

Yes
No
Unsure

13: Please briefly list or describe any guidelines or protocols that you or your facility uses to manage concussion/mTBI cases: *[Open-ended]*

14: Have you received any training **through your employer** specific to the assessment, management, and/or institutional policy regarding concussion/mTBI?

Yes
No

15: Have you completed any training--outside of training offered by your employer--specific to the assessment or management of concussion/mTBI (e.g., CEU courses, graduate coursework)?

Yes
No

16: *[Display if "yes" selected]* Please describe your training briefly:

17: In approximately what percentage of the concussion cases you see do symptoms persist for longer than 4 months? *[Open-ended]*

18: In approximately what percentage of **all** concussions nationwide would you estimate that symptoms persist for longer than 4 months? *[Open-ended]*

19: Are there any **formal** cognitive and/or communication assessments that you typically use in concussion cases?

Yes
No

20: *[Display question if "yes" selected]* Please list the most frequently used assessments. List up to four (4). *[Open-ended]*

21: What (if any) methods of *informal* assessment do you use in concussion cases? Describe briefly.

22: How do you determine which formal and/or informal assessment measures to use when assessing a new concussion case? *[Open-ended]*

23: Over the course of treatment for persistent concussion symptoms, how many times do you typically administer formal measures (e.g., a validated rating scale, standardized test) to assess progress?

0
1
2
3
4+

24: In your current work setting, which professionals are typically involved in the evaluation and/or treatment of concussion cases?

Physician	Neuropsychologist
SLP	Classroom teacher
Athletic Trainer	Physical Therapist
Special education teacher	Psychiatrist
Nurse	Occupational Therapist
Psychologist or counselor	Ophthalmologist or optometrist
Other:_____	

25: Of the professionals you have identified, who in your workplace is typically the primary care coordinator in cases of persistent concussion symptoms?

[Selected responses to Q22]

26: To which professional(s), if any, do you most often refer concussion cases for additional evaluation or treatment? Select up to four (4).

Physician	Neuropsychologist
SLP	Classroom teacher
Athletic Trainer	Physical Therapist
Special education teacher	Psychiatrist
Nurse	Occupational Therapist
Psychologist or counselor	Ophthalmologist or optometrist
Other:_____	

I do not typically refer patients or students to other professionals

27: From whom do you, as an SLP, receive the most referrals from for concussion cases?

Physician	Neuropsychologist
SLP	Classroom teacher
Athletic Trainer	Physical Therapist

Special education teacher	Psychiatrist
Nurse	Occupational Therapist
Psychologist or counselor	Ophthalmologist or optometrist
Self-referral	Other:_____

28: How well do you feel that your academic and professional training has prepared you to conduct a successful assessment when meeting a new patient or student with a primary diagnosis of concussion/mTBI?

Extremely well
Very well
Moderately well
Slightly well
Not well at all

29: How well do you feel that your training has prepared you to provide adequate treatment for cognitive/communicative impairment specific to patients or students with a primary diagnosis of concussion/mTBI?

Extremely well
Very well
Moderately well
Slightly well
Not well at all

30: To your knowledge, are there resources (e.g., standardized tests, additional training, treatment tools) not currently available in your workplace that would allow you to feel more prepared when assessing and managing concussion/mTBI?

Yes No

31: *[Display question if "yes" selected]* Which additional resources would be beneficial for increasing your confidence and/or preparedness when assessing or managing concussion?

32: Overall, how confident do you feel in **assessing** new concussion cases?

Extremely confident
Very confident
Somewhat confident
Slightly confident
Not at all confident

33: Overall, how confident do you feel in **treating** persistent concussion symptoms?

Extremely confident
Very confident
Somewhat confident
Slightly confident
Not at all confident

34: In your professional experience, are there any factors that you have found to make a particular patient or student more prone to long-term concussion symptoms? Please list briefly. *[Open-ended]*

35: Are there any factors that you have found to lead to a quick recovery (<10 days) for a patient or student who has suffered a concussion/mTBI? Please list briefly. *[Open-ended]*

36: Which of the following persistent concussion symptoms (lasting longer than 4 months post-injury) do you most frequently see in patients with concussion/mTBI? Select up to 4.

I have not treated persistent cognitive/communicative symptoms
Memory challenges
Attention or concentration deficit
Disorganization
Impaired judgement or self-control
Reading or writing impairment
Speech or language impairment
Social communication
Comorbid somatic symptoms (e.g., headaches)
Comorbid emotional symptoms (e.g., depression)
Other:_____

37: Which of the following persistent concussion symptoms (lasting longer than 4 months post-injury) do you most frequently address in *your treatment* of patients with concussion/mTBI? Select up to 4.

I have not treated persistent cognitive/communicative symptoms
Memory challenges
Attention or concentration deficit
Disorganization
Impaired judgement or self-control
Reading or writing impairment
Speech or language impairment
Social communication
Comorbid somatic symptoms (e.g., headaches)
Comorbid emotional symptoms (e.g., depression)
Other:_____

38: Which, if any, of the following treatment approaches do you use to treat persistent concussion symptoms? Check all that apply.

Computerized neurocognitive training or treatment
(e.g., computerized attention training program)
Cognitive/metacognitive strategy training
(e.g., strategies for self-monitoring behavior, making a to-do list, self-talk)
Psychoeducation
(e.g., educating patient about concussion, promoting symptom tracking)
Reading or writing instruction
Psychosocial counseling
Training of assistive devices
(e.g., smartphone app as a memory aid)
Small group therapy
Other:_____
None of the above

39: *[Display if more than 3 choices to Q35]* Of the treatment approaches that you have identified, which do you use most frequently with patients or students who have persistent symptoms after a concussion? Select no more than 3.

[Display choices selected in Q35]

40: Is there anything that makes the SLP uniquely qualified to assess and/or treat concussion cases?

Yes
No
Unsure

41: *[Display if "yes" selected]:* Please list any skills, expertise, and/or training that makes the SLP uniquely qualified to assess and/or treat concussion: *[Open-ended]*

APPENDIX B

CONSENT STATEMENT

The following consent statement was displayed to each respondent who followed the emailed link to the survey:

Thank you for your participation in this project. Please take a moment to review the following statement. Click the arrow button below to consent to these terms and begin the survey.

This survey is part of a research study investigating the perspectives and practices of licensed SLPs who treat individuals with persistent cognitive, communicative, or somatic symptoms following concussion (i.e., mild traumatic brain injury, mTBI). You have been asked to complete this survey because your perspectives could contribute to this knowledge base and to the eventual development of effective treatment protocols. This survey is approved by the University of Oregon Committee for the Protection of Human Subjects (CPHS). It should take no more than 20 minutes of your time. Responses will be anonymous, we will not ask for identifying information (e.g., name, address, etc.), and the IP address of respondents is not recorded. Your participation is entirely voluntary, and you may discontinue the survey at any point. This link will be active for 4 weeks, and you may return to the survey at any point during that time.

Contacts

If you have any questions about this research study, please contact the graduate student researcher, Elise Johnston, at ejohnst7@uoregon.edu or the faculty advisor, Dr. McKay Sohlberg, at mckay@uoregon.edu. Questions or concerns about your rights as a participant can be directed to the Research Compliance Services office at the University of Oregon, at researchcompliance@uoregon.edu. Thank you in advance for your contribution.

[Arrow Display Button]

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