Speech Pathology Assessment of Language and Cognitive Communication Following Traumatic Brain Injury and Developmental Language Impairment:

A Survey of International Clinical Practices

Matthew HJ Frith

Bachelor of Speech Pathology (Hons)

University of Newcastle, NSW, Australia

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Author's Contribution

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I, Matthew HJ Frith, was primarily and principally responsible for the following development of the research proposal, submission for ethical approval, data collection, data management, data analysis and interpretation and presentation of findings.

I acknowledge the assistance of my supervisors who provided constructive feedback and critique throughout all stages of the research including development of the research questions, research methods, data analysis and interpretation and reviewed initial drafts of the thesis.

Signed

Matthew HJ Frith

B Spth (Hons) MSPAA CPSP

August 2014

Declaration of Originality

Speech Pathology Assessment of Language and Cognitive-Communication

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I certify that this thesis and the research reported in it are original. It contains no material which has been submitted for the award of any degree in any other University and that to the best of my knowledge and belief, this thesis contains no copy or paraphrase of material previously published or written by another person, except where due reference is made in the text of the thesis.

Signed

Matthew HJ Frith

B Spth (Hons) MSPAA CPSP

August 2014

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Presentations & Publications

Frith, M., Togher, L., Ferguson, A., Levick, W., Docking, K. (2014). Assessment practices of speech language pathologists for cognitive communication disorders following traumatic brain injury: An international survey. *Brain Injury.* Advanced online publication. doi:10.3109/02699052.2014.947619

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Abstract

Cognitive communication disorders subsequent to a traumatic brain injury (TBI) or a developmental language impairment (DLI) are two cognitively and linguistically different disorders. Speech Language Pathologists (SLPs) play a pivotal role in maximising the long-term educational, vocational, psychosocial, and social outcomes for the individual with such a disorder. Despite this acknowledgement, little is documented from an international perspective about the current assessment practices of SLPs in TBI or DLI and the evidence-based practice that is applied when choosing the most appropriate assessment tools to assess these communication disorders.

Assessment practices of SLPs in language and cognitive communication were compared across three clinical groups: adult TBI, paediatric TBI and DLI. Online survey methodology was utilised to investigate the SLPs' use of commercially available and informal methods of communication assessments as well as their perceptions of the utility of communication assessments in clinical practice. Specific information was obtained from SLPs working in paediatric TBI and DLI about the use of one specific standardised developmental language assessment: the Clinical Evaluations of Language Fundamentals Fourth Edition (CELF 4; Semel, Wiig, & Secord, 2003).

Results highlighted that SLPs working in adult TBI placed more focus on functional communication and tools for cognitive communication disorders whilst also using aphasia assessments incorporating word and sentence-level tasks. SLPs working in both paediatric TBI and DLI focused on receptive and expressive language. More specifically, those SLPs working solely with DLI populations focused less on functional communication and more on vocabulary skills. They also used the

same tool e.g. the CELF-4 (Semel et al., 2003), which specifically uses subtests measuring core, receptive and expressive language. There was little difference between SLPs working in either TBI or DLI populations in how the tests were used. It was also noted that a small percentage of SLPs used other assessment tools to assess discourse, social skills and functional communication in paediatric TBI and DLI. Although discourse was not routinely assessed by any of the SLPs, when it was conducted, it was done informally via a conversation with the client and no data collection.

The findings from the study highlight the need for standardised clinical guidelines in the assessment of language and cognitive communication disorders. Education about cognitive and linguistic difficulties specific to TBI is highlighted for SLPs with less clinical experience in this area. Additionally, assessment tools that target skills beyond traditional word and sentence-levels tasks are required in order to inform the SLP about the strengths and weaknesses of an individual's communication skills.

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Chapter 1 - Literature Review

1.1   Introduction

Speech Language Pathologists (SLPs) can play an integral role in the lives of adults and children with developmental and acquired communication disorders. Language and cognition are fundamental components of communication (Body & Perkins, 2006) and as such impact significantly on the educational, vocational, psychosocial, and social outcomes of an individual's life. The role of clinical assessment for the SLP is to incorporate this knowledge about the interrelationship between language and cognition with the use of appropriate assessment tools and clinical reasoning skills (Coelho, Ylvisaker, & Turkstra, 2005b). It is paramount that SLPs use the evidence-based tools to support clinical decision-making in the development and implementation of an individualised therapy program in order to meet the needs or goals of their clients.

There is a myriad of choice for the SLP when it comes to which assessment they should use, the right choice being determined by many factors (Betz, Eickhoff, & Sullivan, 2013; Frank & Barrineau, 1996; Frank, Williams, & Butler, 1997). There are many standardised/norm-referenced assessment tools available that target developmental and acquired communication disorders both for adults and children. However, these assessment tools are often insufficient to provide an all-inclusive picture of an individual's communication needs (Coelho et al., 2005b). Clinical assessment tools are designed to target different aspects of communication and language, which range from an impairment focus examining basic components of language and communication, such as word and sentence-level tasks, to a broader social and discourse perspective using the context of the individual's environment.

The choice of the assessment tool can sometimes be clinically inappropriate for a specific client population in that they do not identify some of the specific communication problems pertinent to that group. One such clinical population is represented by children and adults with cognitive communication disorders subsequent to traumatic brain injury (TBI), which is described as a communication disorder manifesting at the discourse pragmatic level of communication (MacLennan, Cornis-Pop, Picon-Nieto, & Sigford, 2002). Should the most relevant weakness in an individual's communication skills not be identified, the choice of assessment tool will negatively impact on goal setting, service delivery, access to therapy, and resources as well as longer-term outcomes in areas of educational and vocational success (Cook, DePompei, & Chapman, 2011).

Acquired and developmental paediatric communication disorders result in different communication profiles (see Chapman, 1997; Lees, 2005). Therefore, they cannot be assessed or treated as one homogenous group. As is standard clinical practice, approaches are also different between assessments for an adult versus a school-aged child. An SLP's approach should reflect these widely accepted differences, but how much is known regarding the tools that are used to enable differential diagnosis? At an international level, little information is available regarding which assessment tools are currently being implemented by SLPs in the areas of acquired or developmental communication disorders. Insight into current clinical practice at both a local and international level would thus provide important knowledge regarding the tools used by clinicians, thereby highlighting to the wider SLP profession some of the factors impacting on clinical reasoning. Such knowledge assists both in highlighting gaps in clinical practice as well as understanding whether evidence-based practice (EBP) is considered when deciding which assessment tools

to use. An international approach towards identifying assessment practices will assist in highlighting similarities and differences between SLPs globally and in identifying a consistent approach to the utilisation of assessment tools in clinical practice.

This study will examine the current clinical assessment practices by SLPs working across three clinical groups. These three groups comprise: (1) adults with acquired cognitive communication disorders following a TBI, (2) school-aged children who have sustained a TBI, and (3) school-aged children with a developmental language impairment (DLI). An overview of the literature in the area of assessment practices follows, as does background information in the area of cognitive communication, TBI, and DLIs.

1.2   Overview of language and cognitive communication disorders

A language delay or disorder is a disruption in either the spoken or written form of language, defined as communication used to exchange thoughts and feelings through words or gestures. Difficulties in language may present across a number of domains including the form of language, such as phonology, syntax, and/or morphology; content, such as semantics; and/or the use of language, such as pragmatics (Reed, 2012b). As mentioned in section 1.1 above, language disorders are also separated into the categories of developmental language disorders or impairments and acquired language disorders, often associated with paediatric TBI. Developmental language disorders are considered to commence in early childhood, where there is a delay in language development, whereas acquired language disorders comprise those where language skills are lost or disrupted due to an event. This thesis will address assessment practices associated with both forms

of language impairment, specifically DLI in school-aged children and acquired language disorders in both children and adults. Of note, the term 'specific language impairment', also used in the literature, is synonymous with 'developmental language impairment', and they can be used interchangeably.

Unlike language delays and/or disorders, the term cognitive communication disorder is not as well known in the area of school-aged children's communication. Rather, it is a specific type of communication disorder discussed in TBI literature, commonly in relation to adults. The term cognitive communication originated from the unique set of characteristics that highlight the nature of communication difficulties present in people with a TBI, quite dissimilar in presentation to an acquired language disorder, such as aphasia in stroke, where a focal lesion is evident (Body & Perkins, 2006). Cognitive communication, or the term cognitive and linguistic communication, represents the interplay between day-to-day linguistic communication activities and cognition, that being the mental thoughts and processes required for learning and knowledge (Ylvisaker & Gioia, 1998). Disruption to cognition can occur both in children (Babikian & Asarnow, 2009) and adults (Dikmen et al., 2009) following a TBI. Areas of cognition affected include memory, attention, processing speed, and most importantly executive function. Executive function can be defined as a collective term describing the skills that involve the ability to identify, judge, manipulate, and regulate one's own behaviour to a task. It can include processes or skills such as working memory, cognitive flexibility, problem solving, self-awareness, planning, and organisation (Ylvisaker & Feeney, 1998). Whilst an impairment in cognitive communication is an accurate description of the set of difficulties following a TBI, this term is not always used with children. Rather, terms such as 'acquired language disorders' are used to describe communication difficulties in children after

a TBI (see; Lees, 2005; O'Donoghue, 2012), most probably due to the premise that a TBI in childhood can disrupt the development of language skills in children depending on the age at injury (Ewing-Cobbs & Barnes, 2002).

It is important to highlight that cognitive processes may also impact on developmental language in relation to the diagnosis of impairments. Many studies have started to examine the cognitive markers associated with developmental language impairments, including executive function (Henry, Messer, & Nash, 2012; Im-Bolter, Johnson, & Pascual-Leone, 2006; Martin & Allen, 2008), working memory (Marton & Schwartz, 2003; Montgomery, Magimairaj, & Finney, 2010), short-term memory (Archibald & Gathercole, 2006), attention (Finneran, Francis, & Leonard, 2009), and speed of processing (Leonard et al., 2007; Miller, Kail, Leonard, & Tomblin, 2001). There has been much debate over the past decade on the impact of working memory on children's language skills, with studies revealing that children with a DLI can present with difficulties with short-term/working memory, highlighting that working memory rather than language acquisition may be the real issue (Webster & Shevell, 2004). This has been demonstrated with tasks examining non-word repetition and sentence repetition (Conti-Ramsden, 2003; Conti-Ramsden, Botting, & Faragher, 2001). The impact of working memory associated with the assessment of aspects of language has also received recent attention (Archibald, 2013; Archibald & Gathercole, 2006) and will be discussed later in this chapter.

While both a cognitive communication deficit and a DLI have fundamental cognitive processes interplaying with linguistic competences, it is necessary to highlight where they do differ. It is also important to highlight the relationship between the underlying neuroanatomical connections and the distinctive patterns of cognitive communication deficits. This will now be discussed.

1.3   Traumatic Brain Injury (TBI)

1.3.1   What is a TBI?

A TBI is a type of acquired brain injury (ABI). Occurring after birth, it is the damage in brain function caused by an external force or impact to the brain (Menon, Schwab, Wright, & Maas, 2010). It differs from ABIs sustained due to infection (encephalitis), oxygen deprivation (hypoxia), or cerebrovascular accident (CVA). TBIs are the leading cause of death in the younger adult population (Zappalà, Thiebaut de Schotten, & Eslinger, 2012).

Depending on the nature of the injury, the results of a TBI can range from mild cognitive communication difficulties to a profound communication impairment. A TBI can be classified as mild, moderate, or severe depending on a number of criteria that include the initial Glasgow Coma Scale (GCS) score (Teasdale & Jennett, 1976) and period of post-traumatic amnesia (PTA; Russell & Smith, 1961) (see Table 1.1). Although this classification should not be solely relied upon, it is important as it contributes to the SLP's understanding of prognosis as well as providing an indication of the potential severity of the overall cognitive, communication, behaviour, and psychosocial outcome (Bishara, Partridge, Godfrey, & Knight, 1992; Walker et al., 2010; Zafonte et al., 1996).

Table 1.1 Descriptions of GCS and PTA

Source: (*Rowley & Fielding, 1991) and (**Petchprapai & Winkelman, 2007)

Criteria	Description	Mild	Moderate	Severe
GCS*	Neurological scale that provides reliable objective measure of a person's level of consciousness. The scale is composed of three response tests: eye, verbal, and motor. The three values separately as well as their sum are considered. The lowest possible GCS (the sum) is 3 (deep coma or death), while the highest is 15 (fully awake person).	13-15	9-12	3-8
PTA**	Assessment that measures a person's state of confusion that can occur after a TBI. This is where the person is disoriented and unable to remember events that occur after the injury. The person may be unable to state his or her name, know where he or she is, or what time it is. The person is asked orientation questions and to recall three pictures. A score that is 12/12 three days in a row is indicative that continuous memory and PTA are considered resolved.	<1hour	>1hr & <24hrs	>24hrs

1.3.2 Causes and prevalence of TBI in adults and children

The causes of TBIs are varied while the incidence of injuries differs depending on a person's age. The highest incidence of severe TBI is in the 15 to 25 year age group, with motor vehicle accidents the most common cause (McKinlay et al., 2008; Tate, McDonald, & Lulham, 1998). Moreover, males are twice as likely to sustain one as women (McKinlay et al., 2008). Apart from this group, TBI is most common in the very young (0-4 years) and elderly (65+). For those over the age of 65 years, the most common cause of severe TBI is falls (Zappalà et al., 2012). TBIs in children under five years are caused predominately from non-accidental injuries commonly known as shaken baby syndrome (Barlow, Thomson, Johnson, & Minns, 2005), but it is also recognised that due to concerns regarding child protection services, these incidents are under reported (John, Kelly, & Vincent, 2013). Interestingly, the five to 10 years age group has the lowest incidence, averaging 1.10 for 100 children, compared with 2.25 per 100 young people aged 15 to 20 (McKinlay et al., 2008). The

cause of TBI in school-aged children can vary depending on the country reporting the findings or whether the TBI is based on accident and emergency data or acute admission to hospital. Overall, TBIs in school-aged children are most likely caused by falls (Asemota, George, Bowman, Haider, & Schneider, 2013; McKinlay et al., 2008; Shivaji, Lee, Dougall, McMillan, & Stark, 2014), but should they suffer a severe TBI, the most likely causes are motor vehicle accidents (Tate et al., 1998).

While the incidence of TBI is lower in school-aged children, the impact a TBI has on a child's course of development can be significant, and TBI in preschool children has been shown to have a significant impact on academic attainment and language and cognitive skills as well as psychosocial outcomes (Anderson, Catroppa, Morse, Haritou, & Rosenfeld, 2009; Anderson, Godfrey, Rosenfeld, & Catroppa, 2012; Anderson & Yeates, 2010; Crowe, Catroppa, Babl, & Anderson, 2012). The age at which an injury was sustained can have a significant impact on cerebral maturation because certain developmental milestones, such as reading, language, vocabulary, and social competences, may not have matured (Zappalà et al., 2012). These outcomes highlight that the SLP can have a significant role not just in the acute rehabilitation but also long-term recovery well after the actual TBI injury, possibly throughout their schooling career.

1.3.3   Mechanism of injury

Owing to the anatomical composition of the cerebrum, the frontal and temporal lobes are very sensitive and are often the most frequently damaged area of the brain, dependent upon the mechanism of the injury (Stuss, 2011). As the frontal and temporal lobes typically collide with the base of the skull first during initial impact, they are rendered more susceptible to injury. This collision of the brain can

cause contusions, which can be explained as bruising to brain tissue. At a structural level, there is also a diffuse axonal injury, causing widespread damage to the tracts that send neuronal responses to different parts of the brain and a shearing of the myelin sheaths.

The roles of the frontal and temporal lobe in communication, combined with the mechanism of injury, are why a TBI can result in such a devastating impact on communication. The frontal lobe has a significant role in cognitive development, previously established as comprised of behaviour, attention, and concentration. It also processes speed as well as inhibition and executive function (Zappalà et al., 2012). The temporal lobe is responsible for language and memory (Stuss, 2011). The most commonly occurring linguistic impairments following a CVA, such as those seen associated with aphasia, often do not manifest in adults with a TBI due to the more widespread nature of damage and the disruption to those connections specifically between the frontal and temporal lobe (Oni et al., 2010).

1.4   Linguistic differences between a developmental language impairment and cognitive communication

Thus far, it has been discussed how cognitive communication disturbances can occur after a TBI, with specific frontal lobe damage being a major contributor in discriminating some of the cognitive difficulties present in someone with a TBI. It is also apparent that children with a DLI present with communication impairments that may be associated with impaired cognitive functioning. However, there are no known studies comparing the two groups in paediatrics or adults on standardised assessments. When a child or adult has sustained a TBI, it may be possible to benchmark pre-injury communication skills for comparison immediately after the TBI.

In contrast to a TBI, there is no baseline of communication skills to compare pre and post-DLI. However, for children who experience a TBI at a very young age where communication skills have not started developing, there may also be little opportunity to measure communication ability prior to the injury. Similarly, in both TBI and DLI, the gap between academic and social communication skills with peers can widen over the course of their development, (Anderson et al., 2012; Poll, Betz, & Miller, 2010). TBI has been characterised by a continuum of severity and clinical presentation resulting in a heterogeneous population (Chapman, 1997; Turkstra, Coelho, & Ylvisaker, 2005a). This heterogeneity is also a feature of DLI (Webster et al., 2006). That is, children with a TBI or DLI could have language deficits across all areas, or in specific areas, such as vocabulary or pragmatics for example. In addition, language delay or disorder could be greater in one child than the other meaning they don't all present with the same issues in communication, or perform the same on language tests. In addition, cognitive deficits could differ in severity between children with TBI and DLI, or they might have specific cognitive strengths or weaknesses in areas such as attention or executive functions, and this has been highlighted in studies examining the variability in cognitive abilities in children with TBI (Conklin, Salorio, & Slomine, 2008) and DLI (Archibald & Gathercole, 2006). Thus, neither TBI or DLI should be treated as homogenous within each group and, as such, the assessment should be targeted to the needs of the individual.

Studies directly comparing the linguistic performance of adults or children with a TBI and/or a DLI are limited (Chapman, 1997; Sullivan & Riccio, 2010), but different clinical markers for English speakers in each group have been noted. Clinical markers in DLI, including difficulties with morphology (Poll et al., 2010), particularly around use of the past tense (Wexler & Rice, 1996) and third person

singular (Conti-Ramsden et al., 2001; Simkin & Conti-Ramsden, 2001), have been shown to be the same both in adults and children who have a DLI. Difficulties in vocabulary and pragmatics may be evident, but these types of tasks may not be the most sensitive tasks to identify a child with a DLI (Leonard, 2000; Webster et al., 2006). Studies comparing DLIs with other disorders, such as autism, have shown that children with a DLI are more likely to perform more poorly on a range of language tasks that cover vocabulary, syntax, morphology, and pragmatics (Demouy et al., 2011; Webster et al., 2006). Moreover, whilst children with a DLI initially have difficulties with oral language, their difficulties broaden to include reading and written language (Friel-Patti, 1999). The SLP's role in assessment often includes reading and written language (Owens, 2014) which has expanded from articulation, phonology, and oral language, which might have been historically seen as the more traditional SLP roles (ASHA, 2010). Aspects of language, communication, and literacy assessed by SLPs will be discussed later in this chapter.

In contrast to a DLI, where there are difficulties with general aspects of language, any individual with a TBI is more likely to have difficulties with more subtle aspects of language and communication (Chapman, 1997; Sullivan & Riccio, 2010). These include areas of semantics such as lexical comprehension or production (Ewing-Cobbs & Barnes, 2002) and pragmatics (MacLennan et al., 2002; McGrane & Cascella, 2000). These difficulties are seen more at the level of discourse both in children (Cook, Chapman, & Gamino, 2007) and adults (Coelho, 2007). However with children, the complicated challenge for the SLP is that age of injury can impact on the severity of language and cognitive communication skills (Crowe, Catroppa, Anderson, & Babl, 2012), so initially, consequences of the TBI in a number of areas including language may be subtle or delayed (Menon et al., 2010). As the child

begins to develop more skills, new learning is compromised, due to the variety of cognitive processes, such attention, memory, processing speed and executive functions that can be impaired after a TBI (Mandalis, Kinsella, Ong, & Anderson, 2007). These cognitive deficits impacts on what the child can process or encode and or consolidate, store or recall when information presented to them. Thus the trajectory of development may be slower as the longer-lasting effects of the injury become more apparent (Chapman, Nasits, Challas, & Billinger, 1999; Vu, Babikian, & Asarnow, 2011).

Word-finding, high-level language, and pragmatic skills are specific areas of language compromised even by a mild TBI (Hough, 2008; Turkstra, McDonald, & Kaufmann, 1996) (Duff, Proctor, & Haley, 2002; King, Hough, Walker, Rastatter, & Holbert, 2006). Areas of language where there are difficulties are often similar irrespective of the individual's age. However, as noted before, the age of the injury may impact on the development of language skills, so a child with a TBI who was injured in preschool or younger can present with more significant receptive and expressive language difficulties (Sullivan & Riccio, 2010). It is yet to be studied whether such difficulties with general language abilities are similar to the effects of a DLI, but some small studies have shown that vocabulary and not grammatical development is more affected in early TBI (Crowe, Anderson, Barton, Babl, & Catroppa, 2014; Trudeau, 2000). In one such study by Trudeau (2000) a case study was used of a child with a TBI and was assessed over a period of 6 months and this was compared to two control groups (n=5 and 9). In this study, vocabulary scores were significantly below the control group, whereas verbal complexity and mean length of utterance had similar scores with the control group.

The school-aged child with a TBI may have preserved ability to construct sentences and use appropriate grammatical structures (Chapman, 1997). Because of this, conversational language including pragmatic skills such as turn-taking, topic maintenance, or gist and summarising should be assessed (Cook et al., 2007). As mentioned earlier, new learning can be impacted, thus impeding vocabulary development. As a result, as the child matures, high-level language skills such as humour (Docking, Murdoch, & Jordan, 2000), figurative language (Yang, Fuller, Khodaparast, & Krawczyk, 2010), and inferential reasoning (Dennis & Barnes, 1990; Dennis & Barnes, 2001) should be targeted areas of assessment. In addition, for children who sustain their TBI in their school years, written language has been identified as an area of weakness (Yorkston, Jaffe, Liao, & Polissar, 1999; Yorkston, Jaffe, Polissar, Liao, & Fay, 1997) as have reading comprehension skills (Dennis & Barnes, 2001). Decoding skills have been identified as an area of weakness for children with a TBI if the injury was sustained prior to early literacy development (Sullivan & Riccio, 2010).

1.5   Importance of a clinical assessment for language and cognitive communication skills

A clinical assessment of language and/or cognitive communication skills should have many components. It is important that the SLP understand the difficulties that may be anticipated for the adult or child with a TBI, or a DLI in children, when conducting a clinical assessment. At a minimum, the SLP should ask some specific questions prior to the assessment including why the individual is being assessed, what specific behaviour or components should be assessed, and the best way to assess it (Owens, 2014). An assessment should assist the SLP and client or client's family to formulate goals and an intervention plan, with the assessment and its tools outlining the strengths and weaknesses of the client's communication skills (Turkstra et al., 2005a).

A clinical assessment can involve a formal or informal assessment or both. In this study, a formal assessment is standardised and has either normative data or benchmark criteria to compare performance with (Owens, 2014). Alternatively, an informal assessment is described as having neither systematic procedure nor normative data against which to compare the individual's performance (Coelho et al., 2005b). Although the principle questions clinicians should ask when deciding on an assessment tool have been discussed in the TBI literature (Turkstra et al., 2005b) these guidelines are also considered to have relevance across a number of clinical diagnoses. The clinicians' questions should address whether the test identifies a cognitive communication and/or language disorder, whether it characterises the components contributing to the performance, whether its results are appropriate to the real-life situations, and whether it assists with decisions about intervention.

While the importance of a clinical assessment has been stressed, little has been documented on the influences of test choice and the measures used to assess language and cognitive communication. The reasons why a clinical assessment is conducted have been discussed by many (see; Owens, 2014; Reed, 2012a; Turkstra et al., 2005b), and the choice of test is not necessarily for adhering to the traditional clinical model of assessment and treatment. A clinical assessment may also be conducted in order to access therapies, for instance those within the education system (Reed, 2012a). In addition, clinicians may need to report on assessment findings to insurers (such as in the area of TBI), thereby justifying the need for service provision. Moreover, there is an increasing expectation amongst agencies that assessment tools used be clinically appropriate and sensitive to identify deficits described by a clinician (Banja, 1992; Ribbers, 2007). If the assessment tool is neither appropriate to describe the communication impairment nor identifies the specific difficulties associated therewith, then the affected individual is at risk of being ineligible for services. It is therefore important to understand some of the external influences affecting SLPs when it comes to test choice. The thesis will now describe some of the frameworks outlined by different researchers in the area of adult TBI, paediatric TBI, and DLI before discussing some of the factors influencing assessment choice and assessment approach by SLPs with these populations.

1.6 Frameworks for assessment of language and cognitive communication

To assist the SLP, there are many theoretical frameworks discussed in the literature looking at assessment of language or cognitive communication. The thesis will now provide an overview of those specific to this topic area.

In children's language and communication, two approaches have been presented, those being the formal traditional approach (using standardised psychometric measures) and the functional approach (using additional descriptive measures) (Owens, 2014). In the formal traditional framework, the components of language — morphology, syntax, phonology, semantics, and pragmatics — can be superficially assessed independently yet remain interconnected. However, with the functionalist approach, pragmatics provides the overall context and conversation.

The child's everyday context is an important aspect for an assessment. For the assessment to be relevant, therefore, a functional approach needs to use many tools, including descriptive or informal methods, in addition to standardised psychometric measures (Owens, 2014). The rationale for this is that standardised psychometric measures do not usually tap into functional language skills within everyday context (Bishop & Baird, 2001). While this approach does use psychometric measures as well, it differs from a traditional formal approach where the use of psychometric measures is the primary tool used in clinical practice. Although this approach views pragmatics as an equal partnership with other components of language, it does not form the overall context of how language is used (Owens, 2014).

Similarly, Body and Perkins (2006) described an approach that parallels that of Owens (2014), one using a framework for the assessment of cognitive communication in populations of adult TBI and other acquired neurological disorders. This framework identifies that components of language and cognition can be assessed separately, but the interplay of language and cognition together is an important component of the assessment. Furthermore, although there are few assessments examining the interaction of cognition and language, as highlighted by

Owens (2014), the relationship of pragmatic skills with the communication environment or context is an essential component to understanding cognitive communication disorders and an important consideration when assessing. It has been noted that SLPs often anecdotally report using assessments designed to assess aphasia or areas of neuropsychology when conducting assessments examining language or cognition. Although these frameworks have an adult focus, they could be applied to a paediatric population, as in school-aged TBI, with the use of developmental language assessments and neuropsychology assessments.

Thus far, frameworks for clinical speech pathology assessments have focused specifically on components of language and/or cognition and have examined pragmatic skills in the context of the environment. However, whilst no specific framework for assessment of cognitive communication or language skills has been discussed in the area of paediatric TBI, an approach using dynamic assessment has been described in the area of cognitive assessment (Ylvisaker & Gioia, 1998). Components of the assessment were described to involve interaction, ongoing observation, and interpretation of the behaviour or activity, and they are specific to the everyday context of the child. Part of this approach was to move away from the standardised assessment process since it is acknowledged that children with a TBI perform quite well on these types of tests and the approach described fits well within a model of rehabilitation.

The use of the context of the adult or child's environment has been used not only in the area of communication but also more broadly in rehabilitation (Stucki, 2005) with The International Classification of Functioning, Disability and Health Model of Functioning and Disability (ICF; World Health Organization, 2001), and a later child and youth version (ICF-CY; World Health Organization, 2007). The ICF is

similar to the other frameworks discussed in that it highlights interaction and social context within the health condition of the individual. However it also separates three levels of function and considers the impairment level, the activity level and person's participation in life. It also highlights how these all interact together, but that one might need more focus than another in the pursuit of increased level of functioning. The one significant difference with this framework is that contextual factors is identified as impacting on the individual and these may either be environmental or personal factors. Whilst this model has been used widely in many medical, nursing, and allied health disciplines, it has also more recently been discussed within speech language pathology in adult TBI and cognitive communication (Hughes & Orange, 2007; Larkins, 2007) as well as paediatric DLI (Campbell & Skarakis-Doyle, 2007) and in school education (Maxwell, Alves, & Granlund, 2012).

1.7 Factors influencing assessment approach and tools used in clinical practice

1.7.1 Clinical guidelines

The approach and tools used in a clinical assessment aid clinical decision-making. These can be influenced by a number of factors. One such factor is the use of evidence statements, such as clinical guidelines, which are described as statements that are supported by current evidence and that provide recommendations for clinical management in a particular speciality (Royal College of Speech & Language Therapists [RCSLT], 2005). Such statements are used in the medical and behavioural science field. Research into the satisfaction of clinical guidelines has been positive, finding them to be both a good education tool and resource for guiding clinicians (Farquhar, Kofa, & Slutsky, 2002).

In countries like Australia and New Zealand, there are no practice guidelines or position papers regarding the selection of relevant assessments in language and cognitive communication. In the UK meanwhile, the Royal College of Speech & Language Therapists (RCSLT) has produced guidelines for the assessment and management of aphasia (RCSLT, 2005). There is currently no reference to cognitive communication disorders. The RCSLT has also produced comprehensive guidelines for the assessment and management of school-aged children in the area of speech and language. These guidelines highlight the need to assess language in context, with the primary choice being within the classroom. Assessment should include receptive and expressive language, including grammar and vocabulary, narrative, discourse comprehension, figurative language, and social language. Guidelines also highlight the connection between language and cognition and recommend that high-level cognitive skills, including executive function skills such as organisation and planning, be examined because they can impact on learning strategies and study skills.

More detailed guidelines for cognitive communication skills are available throughout the USA and Canada. The American Speech-Language-Hearing Association (ASHA) has produced a number of general guidelines and position papers on the assessment of cognitive communication disorders (ASHA; 2005; 2003), whereas the College of Audiologists and Speech Language Pathologists of Ontario (CASLPO) has produced detailed preferred practice guidelines both for the assessment and management of cognitive communication disorders (CASLPO, 2002). Both papers make reference to assessment of cognitive functions such as attention, concentration, executive function, and memory/new learning as well as

linguistic components like auditory comprehension, oral expression, discourse, word-finding, reading rate, comprehension, and written expression.

ASHA has also developed some guidelines for the assessment of spoken and written language in school-aged children (ASHA, 2004). They suggest that an assessment should make reference to receptive and expressive language, reading and writing, discourse expressions and comprehension, pragmatic skills, and higher-order language and cognitive skills such as metacognition, self-regulation, planning, and organising skills. The ASHA guidelines also mentioned monitoring of cognitive communication skills with reference to children with a DLI, and all guidelines make reference to the use of standardised and non-standardised sampling and/or observation methodology.

The Academy of Neurologic Communication Disorders and Sciences (ANCDS) has similarly published guidelines on standardised testing (Turkstra et al., 2005b) in the area of TBI. They suggested a number of assessments that could be used for anyone with a TBI. Very few assessments passed their criteria for reliability and validity and even fewer that could be used for cognitive communication. These will be discussed later in this chapter. Whether these guidelines influence clinical practice has not been measured, nor has a review comparing clinical practices of SLPs from countries where a guideline does or does not exist been conducted.

1.7.2   General factors influencing assessment approach and choice

Other general factors have been discussed as influences on the assessment tools used in clinical practice. Time factors, such as available clinical time and the time required administering a test, impact on assessment choices (Frank & Barrineau, 1996; Simmons-Mackie, Threats, & Kagan, 2005; Verna, Davidson, &

Rose, 2009). Such factors can potentially act as a barrier to discourse assessment given that time taken to transcribe and analyse connected speech samples can be considered more time consuming (Coelho et al., 2005b). This literature might suggest that the lengthier the assessment, the more potential a barrier it is to its use in clinical practice.

Surveys of SLPs working with TBI populations in the USA have highlighted that undergraduate training does not provide adequate education (Frank et al., 1997; McGrane & Cascella, 2000), particularly so in the area of paediatric TBI. Years of clinical experience is also reported to be a factor in assessment choice and approach in cognitive communication in children (Frank, Williams, & Butler, 1997). Additionally, it has been highlighted that less experienced clinicians often rely on standardised measures to inform them whether a child's language skills are within normal range or disordered. However, with increased experience and knowledge, the clinicians develops skills for identifying language behaviours, by the use of descriptive measures, that are not considered age appropriate (Owens, 2014).

Advice provided by mentors or experienced clinicians has also been found to be a factor when SLPs make clinical decisions (Ylvisaker et al., 2002; Zipoli Jr & Kennedy, 2005). This has implications for rural and regional clinicians working in isolation. Other surveys have demonstrated that test choice was also more likely based on advice from colleagues, workshops, and conferences rather than EBP literature (Frank & Barrineau, 1996).

Interestingly, EBP is not often considered a main factor in clinical decision-making for assessment choice by SLPs working in adult TBI (Frank & Barrineau, 1996). Surveys have shown that SLPs working with school-aged children did not believe they had the time to dedicate to EBP (Hoffman, Ireland, Hall-Mills, & Flynn,

2013) and that time to implement new ideas or procedures was restricted in many

work settings (O'Connor & Pettigrew, 2009). Conversely, the more experienced the

clinician, the more likely they reported having implemented EBP (Zipoli Jr &

Kennedy, 2005).

Whilst the psychometric properties of an assessment have been suggested as

an important consideration in the use of an assessment (Turkstra et al., 2005b), a

number of studies have identified that this is not the case. It has been reported that

SLPs working in the areas of adult TBI (Frank & Barrineau, 1996), paediatric TBI

(Frank et al., 1997), and paediatric DLI (Betz et al., 2013) often do not choose a test

based on its sensitivity or specificity to their clinical population. This is likely due to

the fact there are very few assessments designed for use with the paediatric TBI

population (Sullivan & Riccio, 2010). Furthermore, it is only recently that

assessments in adult TBI have started to emerge (for example; Douglas, Bracy, &

Snow, 2007; McDonald, Flanagan, Rollins, & Kinch, 2003).

Conversely, studies examining SLPs working across the three clinical groups

have shown that tools are chosen based upon whether they identified deficits and

assisted with goal setting and therapeutic planning (Frank & Barrineau, 1996; Frank

et al., 1997). Moreover, factors considered in tool selection comprised whether

assessments had a more recent publication date, had been around longer and thus

were more commonly known, or had been updated often with multiple editions.

Likewise, if so, they were more likely to be used in the area of paediatric DLI (Betz et

al., 2013).

Setting of care could also be considered a factor in assessment choice. Given

the vast differences in the inpatient acute/rehabilitation setting and community

setting, goals by the adult or the child and their family may differ, with the approach

focusing on returning home. Once back in the community, goals may change to reintegration with work, peers, or school (Galvin, Froude, & McAleer, 2010). Whatever the setting, different assessments altogether may be required. With the dramatic changes initially seen in TBI rehabilitation, screening tools or informal assessments may be used instead of standardised assessments, particularly in the period of PTA (Steel, Ferguson, Spencer, & Togher, 2013). Conversely, the focus may initially be on dysphagia in severe cases rather than communication (Morgan & Skeat, 2011).

When looking at school versus clinic-based services, there may be a different focus. Rather than oral language, the focus may specifically be around literacy (Tambyraja, Schmitt, Justice, Logan, & Schwarz, 2014). In addition, there may be a move away from direct therapy to compensatory strategies and support for the teacher. Conversely, in some settings of care, this is a potential overlap with other disciplines in the role of what is assessed. In the context of working with an individual with a TBI, the SLP might work within a team with occupational therapists and neuropsychologists, so the overlapping roles of cognitive rehabilitation could mean that the SLP might not have to assess all aspects of communication. Cognition is one example. The authors of one study highlighted that SLPs and neuropsychologists alike had a role in the assessment of cognition (Sander, Raymer, Wertheimer, & Paul, 2009). Similarly in paediatric TBI and DLI, there is potential overlap with psychologists and SLPs since both have a role in reading, writing, and language (Nellis, Sickman, Newman, & Harman, 2014).

The thesis has thus far established what a TBI is and how it causes a cognitive communication disorder. It has also defined DLI and how it differs from cognitive communication as well as the importance of understanding this distinction

when conducting an assessment. Frameworks for how an assessment should

proceed have been highlighted, as have factors that influence these possible

choices. The review will now examine clinical assessment tools used by clinicians

and researchers in the areas of adult TBI and paediatric DLI and TBI.

1.8   Assessment practices by SLPs working in adult TBI

The assessment of cognitive communication in adults after a TBI has received considerable attention in the last decade. A positive outcome is that SLPs now have access to assessments that have had their statistical properties and clinical utility formally reviewed in relation to the TBI population to ensure that they are evidence based (for example, Douglas et al., 2007). Despite this, there is no known research that has looked at the current assessment practices of SLPs working in adult TBI to ensure that this evidence-based practice is being utilised in clinical practice.

Only one survey to date has reported surveying the perceptions of SLPs across areas of communication assessed in clinical practice. A study by Ellmo, Graser, and Calabrese (1997) surveyed SLPs working in the USA. It reported that the key areas assessed as reported by the SLPs included receptive and expressive language, pragmatics, reading, writing, and cognition.

There has been a push internationally to focus on functional assessments. In this regard, the use of the International Classification of Functioning, Disability and Health model (ICF; World Health Organization, 2001) acts as a guide for SLPs working in rehabilitation settings to examine the context of the client's environment and also target functional activities (Hughes & Orange, 2007; Larkins, 2007). Not all standardised assessments examine functional communication, though, so researchers have attempted to guide the clinician to move away from impairment-type tests like aphasia assessments (Hughes & Orange, 2007; Larkins, 2007) and apply this ICF model to assessment choice with assessments such as the FAVRES (MacDonald, 2003) and ASHA FACS (Frattali, Thompson, Holland, Wohl, & Ferketic, 1995) as tools assessing activities and participation. Whether this has had an impact on assessment practices in adult TBI is yet to be evaluated.

Despite the availability of guidelines to support the SLP in clinical decision-making, such as ANCDS's guidelines on standardised testing (Turkstra et al., 2005b) presented earlier in section 1.7.1, they have received very little citation. The ANCDS surveyed clinicians and test distributors about assessments recommended for use in TBI and cognitive communication disorders (Turkstra et al., 2005b). Of the eighty-five tests reviewed by the ANCDS committee for reliability and validity, only five were recommended for adult clients. The tests recommended by the ANCDS committee are outlined in Table 1.2.

Table 1.2 Recommended standardised tests by ANCDS Committee

	ANCDS-Recommended Standardised Tests	Author
1	Functional Independence Measure (FIM)	Uniform Data System for Medical Rehabilitation (1996)
2	American Speech Language Hearing Association Functional Assessment of Communication Skills in Adults (ASHA FACS)	Frattali et al. (1995)
3	Communication Activities of Daily Living Second Edition (CADL-2)	Holland, Frattali, and Fromm (1999)
4	Repeatable Battery for the Assessment of Neuropsychological Status (RBANS)	Randolph (2001)
5	Western Aphasia Battery (WAB)	Kertesz (2006).

It was noted that the assessments reviewed were not all communication assessments. The RBANS (Randolph, 2001) was designed to be used by neuropsychologists, its focus not being communication, and the FIM (Uniform Data System for Medical Rehabilitation, 1996) is an assessment also covering self-care and mobility with one seven-point Likert scale each for comprehension, expression, social interaction, problem solving, and memory.

Ssome differences in assessment practices and the tools used have been highlighted to be different depending on the setting of care where the SLP works. These have included standardised assessment practices (Wilson, Harpur, & McConnell, 2007) in the acute setting with minimally conscious patients. However, during the period of PTA, assessment practices may be utilised more for informal observation (Steel et al., 2013). If a standardised assessment is used in the acute setting, short tests are usually preferred, and one such test, the Cognitive Linguistic Quick Test (CLQT; Helm-Estabrooks, 2001), has been proven useful in identifying deficits in the initial stages of recovery in an acute setting of eighty-three patients with varying severity of TBI (Blyth, Scott, Bond, & Paul, 2012).

Two studies comparing SLP assessment practices across settings have highlighted that the choice of assessment tools does not change regardless of whether the setting is an acute environment or community or in a context of return to home and work (Frank & Barrineau, 1996; Verna et al., 2009). This raises serious questions about the statistical validity of the same assessments repeated within short periods of time. Interestingly, however, this has not been raised as an issue in clinical practice; indeed, in assessment practices by neuropsychologists, it is an important consideration(Goldstein & McNeil, 2013).

More recently, for after a mild TBI, there has been a stronger focus on assessment practices for cognitive communication disorders in US studies (Duff et al., 2002; Parrish, Roth, Roberts, & Davie, 2009) and the need to consider different assessment protocols for cognitive communication difficulties. SLPs in the USA reported using cognitive assessments, such as the Ross Information Processing Assessment (RIPA; Ross-Swain, 1996), as well as aphasia assessments. The aphasia assessments included the Boston Diagnostic Aphasia Examination Third

Edition (BDAE; Goodglass & Kaplan, 2000), which is a linguistic assessment with tasks ranging from word to discourse level, in addition to a one-word, picture-naming test, like the Boston Naming Test (BNT; Kaplan, Goodglass, & Weintraub, 2001). These results were similar to another study from the USA in which assessment practices were surveyed but the severity of TBI population was not defined (Frank & Barrineau, 1996). Protocols designed by SLPs working with combat-injured servicemen highlighted different assessment tools (Parrish et al., 2009), including the more recently developed Functional Assessment of Verbal Reasoning and Executive Strategies (FAVRES; MacDonald, 2003), an assessment specifically designed to examine higher-level cognitive linguistic abilities. Cognitive assessments, including the Attention Processing Test (APT; Sohlberg & Mateer, 2001), were also used.

It is also interesting to examine the choice of assessments used by researchers when examining cognitive communication disorders after a TBI. Standardised developmental language assessments designed for adolescents and young people have highlighted potential for use in the mild TBI population (Wong, Murdoch, & Whelan, 2010). Various subtests from assessments like the inference/listening comprehension subtest from the Test of Language Competence (TLC-E; Wiig & Secord, 1989) and the vocabulary subtest from The Word Test 2 (TWT; Bowers, Huisingh, LoGiudice, & Orman, 2005) have been included. This possibly highlights that these assessments may be recognised by researchers as potentially sensitive tools to the subtle linguistic deficits post-TBI and therefore have a place in adult practice for young people returning to work or in vocational studies.

There is a paucity of reports regarding the assessment of cognitive communication disorders following TBI across different countries. However, studies

investigating aphasia assessment practice have been more prevalent. In one study, assessment practices by SLPs from the USA, Canada, the UK, and Australia were evaluated (Katz et al., 2000). There were similarities in the choice of assessment tools, with SLPs reporting primarily using the WAB (Kertesz, 2006), BDAE-3 (Goodglass & Kaplan, 2000) and BNT (Kaplan et al., 2001). The BDAE-3 (Goodglass & Kaplan, 2000) in contrast to the WAB (Kertesz, 2006) has been normed on a large group of people with aphasia, and had good reliability and valildity with the aphasia population. The BNT (Kaplan et al., 2001) also had good reliability and valildity but moreso with the elderly population (Graves, Bezeau, Fogarty, & Blair, 2004).

Both the Psycholinguistic Assessment of Language Processing (PALPA; Kay, Coltheart, & Lesser, 1992), a word and sentence-level linguistic test, and the Mount Wilga High-level Language Assessment (MWHLL; Christie, Clark, & Mortensen, 1986), which examines sentence and discourse-level linguistic tasks, were reported as being more popular assessments in the UK and Australia. Both assessments have had limited psychometric evaluation, with the MHWLL (Christie et al., 1986) having no empirical research conducted to evaluate its reliability and validity, and the PALPA (Kay, Coltheart, & Lesser, 1992) has normative data for only a small sample size of non brain injured patients. As outlined by the authors, non brain injured patients and patients with aphasia perform at ceiling level.   Other studies that have reviewed assessment practices in aphasia within Australia have highlighted the prevalent use of the MWHLL (Christie et al., 1986) in acute and community settings, with over 70% of SLPs reportedly using it in clinical practice (Katz et al., 2000; Verna et al., 2009; Vogel, Maruff, & Morgan, 2010). Interestingly, even though there has

been some research into assessment practices, the studies did not report SLP satisfaction rating using this assessment in clinical settings.

1.8.1   Summary of assessment practices of SLPs working in adult TBI

SLPs prefer to use standardised assessment tools to assess people with TBI regardless of the purpose of the assessment. Despite this, there are promising indications that communication assessments are being developed that investigate cognitive communication during real-life communication activities (for example; MacDonald, 2003). As yet, research reviewing assessment practices has highlighted the common use of aphasia assessments. Given the fact that there has been for more than a decade no investigation of assessment practices of SLPs working in the field of TBI, there is a need to examine current practice. This would identify whether evidence-based assessment tools are currently used to evaluate cognitive communication disorders after TBI. Concerning the mild TBI population, preliminary evidence suggests that there are some differences in test use, with some higher-level cognitive linguistic skills being examined, but aphasia assessments are still a test of choice. Assessment practices for SLPs working in DLI will now be discussed.

1.9   Assessment practices of SLPs working in paediatric DLI

There are no known studies that have reported on SLP perception of areas of communication assessed in clinical practice in paediatric DLI or on formal recommendations for assessment tools to use with this group. It is suggested by authors that the performance data yielded by formal standardised assessments designed for this population needs to be interpreted and utilised with caution should the focus of the assessment be based solely on one test (Owens, 2014).

Additionally, as all standardised DLI tools are not the same, there are strengths and weaknesses in each test. For example, the Peabody Picture Vocabulary Test (PPVT; Dunn & Dunn, 1981; Dunn & Dunn, 1997, 2007) is a one-word, picture-matching test described as an assessment-measuring receptive vocabulary. It has been reported in many studies as being used by SLPs (Caesar & Kohler, 2009) and neuropsychologists (Strauss, Sherman, & Spreen, 2006). However, Owens (2014) cautioned that this assessment did not evaluate how deep a child's comprehension was or their understanding of definitions and that it provided limited information about the semantic deficits and word-learning abilities in children (Brackenbury & Pye, 2005). In addition, studies looking at the diagnostic accuracy and interchangeability of the PPVT between earlier and later versions has shown that there is variability in performance of pre school children and that many children with a specific language impairment would perform well on such tests (Spaulding, Hosmer, & Schechtman, 2013; Ukrainetz & Duncan, 2000). There are mixed reviwes about the strengths of the PPVT, with one study commending itsits validity and reliability (Ryan, Glass, Sullivan, Gibson, & Bartels, 2009) and correlations with overall cognitive functioning in children (Castellino, Tooze, Flowers, & Parsons, 2011). Whereas, other studies which reviewed the PPVT III, showed that it lacked the sensitivity and specificity to accurately diagnose a child with a developmental language impairment (Spaulding, Plante, & Farinella, 2006). Owens (2014) also advised that the Test of Auditory Comprehension (TACL; Carrow-Woolfolk, 1998), measuring understanding of single words, phrases, and sentences, was not useful for easily distracted children. Similarly, this assessment does not have sensitivity or specificity data to demonstrate its accuracy in diagnosing a child with a language impairment (Spaulding et al., 2006). These strengths and weaknesses concur that

not all assessments are the same and that the SLP needs to consider which assessment is appropriate each time they assess a child even recognising that these assessments are all designed for paediatric DLI.

Few studies outside of the USA investigate clinical assessment practices by SLPs in school-aged children for DLI, and none are known to compare international SLP practices. A few comprehensive studies in the USA have highlighted some consistency in the tools used by SLPs (Beck, 1995; Betz et al., 2013; Caesar & Kohler, 2009; Huang, Hopkins, & Nippold, 1997). Assessments used by SLPs from the USA have favoured one-word picture vocabulary tests, such as the PPVT mentioned above (Dunn & Dunn, 1981) and the Expressive One-Word Picture Vocabulary Test (EOWPVT; Gardener, 1990), which were popular assessment tools across all of the studies, yet have been shown to lack diagnostic accuracy (Friberg, 2010; Spaulding et al., 2006). Omnibus measures (tools with multiple subtests to evaluate language skills) such as the CELF in its various revisions, including CELF–R (Semel, Wiig, & Secord, 1987), CELF-3 (Semel, Wiig, & Secord, 1995), and CELF-4 (Semel et al., 2003), were also popular. The CELF -4 has been reported to have good diagnostic accuracy and the highest senstivity and specificty data for use with school age children (Friberg, 2010; Spaulding et al., 2006). The Test of Language Development (TOLD-2; Hammill & Newcomer, 1988) was highlighted as a frequently used tool (Caesar & Kohler, 2009; Huang et al., 1997) and, most recently, the Comprehensive Assessment of Spoken Language (CASL; Carrow-Woolfolk, 1999) showed increased popularity with SLPs assessing school-aged children (Betz et al., 2013), but has not shown to be a reliable to tool to differentiate normal and language impaired indivdiuals (Spaulding et al., 2006). These studies cited did not investigate whether these omnibus measures were used in full or whether certain subtests were

used over others. Assessments reported as owned by SLPs yet rarely or never used included TACL (Carrow-Woolfolk, 1998) and Test of Problem Solving (TOPS; Huisingh, Bowers, & LoGiudice, 2005) as well as the Children's Communication Checklist (CCC-2; Bishop, 2003a), Renfrew Bus Story (RBS; Renfrew, 1991), and Test of Reception of Grammar (Bishop, 2003b). Standardised assessments evaluating discourse were not popular assessment tools.

The use of standardised assessments by researchers is another way of identifying potential assessments to use in clinical practice. However, this may not always reflect clinical practice because studies that evaluate new tools reflect emerging trends and theories, such as the investigation of pragmatic language and functional communication skills (Bishop & Baird, 2001; Bishop & McDonald, 2009; Farmer & Oliver, 2005). One assessment commonly used in the area of research is the CCC-2 (Bishop, 2003a), a standardised questionnaire completed by the teacher and parent or carer. This test allows the SLP to review communication and social skills not necessarily targeted in traditional developmental language assessments (Bishop & McDonald, 2009). Although these assessments may not necessarily represent current SLP practice, they highlight potential directions in assessment practices.

Whilst no studies have reviewed different assessment practices across major English-speaking countries, some studies examining DLI possibly highlights that assessment choice can be influenced by the country involved, at least in research practices. This will be discussed below. Researchers often use standardised language tools as part of the methodology criteria to ensure participants meet criteria for language impairment or for comparing against normal controls, which is not necessarily the same methodolody for a langugae assessment in clinical practcie. A

review of a number of studies highlights variability in assessment tools depending on the nature of the study and where the researchers are based. For example, tools originating in the researcher's country, such as the British Picture Vocabulary Scales II (BPVT2; Dunn, Dunn, Styles, & Sewell, 1997), have been used in studies from the UK to measure vocabulary skills (Bignell & Cain, 2007; Farmer & Oliver, 2005; Williams, Larkin, & Blaggan, 2013). Other UK assessments, such as Renfrew Action Picture Test (RAPT; Renfrew, 2003) and the TROG3 (Bishop, 2003b), are popular in studies also originating in that country (Farmer & Oliver, 2005). Similarly in studies from the USA, the CELF-4 (Semel et al., 2003) and PPVT 3 (Dunn & Dunn, 1997) are often used (Webster et al., 2006). The studies using the assessments mentioned above were considered accurate in screening children with a language impairment by the authors of the study.

Omnibus measures of language have also been used to screen language in research studies though not always in their entirety, with researchers often using only a few subtests or one specific domain of an assessment (for example; Webster et al., 2006) . The CELF (Semel et al., 1987; Semel et al., 1995, 2003) is one such assessment commonly used in research and is rarely used in its entirety; rather, it has focused on one subtest (for example; Hesketh & Conti-Ramsden, 2013) or a few key subtests contributing to a summary score (for example; Rescorla, 2002).

The role of SLP in literacy development has been more widely accepted in the past decade or more with SLPs working more with teachers and psychologists in the prevention and remediation of early literacy difficulties (Nellis et al., 2014). ASHA (2001, 2010) highlighted this important aspect of the role of an SLP by updating their guidelines to include the responsibilities of SLPs working with children with reading and writing difficulties in schools (ASHA, 2010). However, given the diversity of the

role of SLPs, there is little in the way of documented examining assessment practices of SLPs working in this area. Current research supports the SLP role in the assessment of phonemic awareness skills and decoding (Girolametto, Weitzman, & Greenberg, 2012) as well as written language skills (Williams et al., 2013). SLPs have also reportedly raised concerns about maintaining EBP with paediatric language and literacy and working in schools as they did not feel adequately prepared in their undergraduate degree, and were not aware of tools or methods available to assess literacy (Blood, Mamett, Gordon, & Blood, 2010). In addition, SLPs reported in another study that they didn't have enough time to conduct EBP so they were aligned with current practice in literacy and school settings (Hoffman, Ireland, Hall-Mills, & Flynn, 2013). It is therefore important that assessment practices of SLPs working in this area be reviewed.

1.9.1   Summary of assessment practices of SLPs working in paediatric DLI

In summary, research so far would indicate that SLPs prefer to use one-word vocabulary tests and omnibus measures such as the third or fourth edition of the CELF (Semel et al., 1995, 2003) in clinical practice. Omnibus measures targeting a broad range of word and sentence level-language tasks may or may not be utilised in full, and little is known about how SLPs use these assessments. In addition, the role of literacy in assessment practices has received little attention given the more widely accepted role the SLP has in emerging literacy and linkages between oral language and literacy (Owens, 2014). Although it is recommended that literacy skills, for example writing, form part of a language assessment for the school-aged child (Owens, 2014; Reed, 2012a), little is known whether this is viable within current

clinical practice. This review will now examine the assessment practices of SLPs working in paediatric TBI and identify if there are any differences to assessment practices of SLPs working in DLI.

1.10   Assessment practices of SLPs working in paediatric TBI

Unlike with adult TBI, there has been much less research in the area of standardised assessment tools for paediatric TBI. Instead, there has been more focus on informal measures such as discourse, which will be discussed later in the introduction. As discussed in section 1.7.1, the ANCDS recommended assessments that could be used in clinical practice, with only one recommended for use in paediatric TBI: the Test of Language Competence – Expanded (TLC-E; Wiig & Secord, 1989). The TLC-E is described in its published manual as being designed to measure higher-level language functions with four subtests: expression of ambiguous sentences, including word and sentence ambiguity; listening comprehension/inferences; oral expression, or recreating sentences; and figurative language. Focused at the sentence and discourse comprehension level, this assessment targets skills such as summarising in the recreating sentences subtest. The normative data is only based on children in the United States, and there is currently no research to support its use in clinical practice; however, it has been used in some studies evaluating language skills after a TBI (Hallet, 1997).

Additionally, the Common Data Elements (CDE) TBI Outcomes Workgroup was convened to provide recommendations for the use of common outcome measures in paediatric TBI research (McCauley et al., 2012). This workgroup recommended assessments for consideration in language and communication in this population. These included the PPVT 4 (Dunn & Dunn, 2007), CELF-4 (Semel et al.,

2003), and the CASL (Carrow-Woolfolk, 1999). However, the assessments were not evaluated under strict criteria for reliability and validity with the paediatric TBI population as the ANCDS committee did in the area of adult TBI (Turkstra et al., 2005).

Unlike paediatric DLI, there are very few assessments designed specifically for paediatric TBI. Whilst adult TBI has progressed with assessments that are reliable and valid for the TBI population, paediatric TBI has had just one recent assessment published: the Paediatric Test of Brain Injury (PTBI; Hotz, Helm-Estabrooks, Nelson, & Plante, 2010). The PTBI has been described as an assessment of cognitive linguistic ability that taps into memory, attention, language, literacy, and metalinguistic skills necessary for school re-integration (Hotz, Helm-Estabrooks, & Nelson, 2001) and has been recommended by the CDE workgroup as an emerging measure that could act as a global outcome measure (McCauley et al., 2012). For use in the acute stages of recovery, its subtests cover orientation, following commands, word fluency, semantic organisation, digit span, naming, storytelling, discourse comprehension, picture recall, and story retell (Hotz, Helm-Estabrooks, Nelson, & Plante, 2009). With a recent release of within the last five years, there are as yet no studies reporting its use in clinical practice.

There is limited documentation on SLP perceptions of those areas of communication they assess as routine clinical practice. Moreover, a systematic search of the literature revealed only one article looking at the assessment practices of SLPs working in paediatric TBI. Frank et al. (1997) conducted a survey of 227 SLPs from the USA across various clinical settings, including rehabilitation, schools, and hospitals. Results revealed that the level of SLP experience with paediatric TBI was mixed, with 41% of SLPs having experience with fewer than 10 clients with a

TBI and 85% of SLPs reporting that less than 20% of their caseload consisted of individuals with a TBI who ranged in age from birth to 18 years. The survey was mailed out to a variety of settings including schools, hospitals, and rehabilitation centres. It included the presentation of a number of formal tests to be commented on, with SLPs asked to nominate the five most frequently used tools in clinical practice. It also included an option for respondents to nominate tools not listed.

The results of the research highlighted that no one single test was used in clinical practice. The two most popular assessments were the one-word picture vocabulary PPVT (PPVT; Dunn & Dunn, 1981) and the Clinical Evaluation of Language Fundamentals – Revised (CELF-R; Semel et al., 1987), but even these were only respectively used by 11% and 10% of the SLPs participating in the survey. Another assessment used by more than 5% of the SLPs surveyed was an adolescent/adult information processing assessment (RIPA; Ross-Swain, 1996), yet it was not generally used with the school-aged population and the survey failed to specify the age group it was used with. Also utilised were the Test of Language Development – Primary (TOLD-2; Hammill & Newcomer, 1988) and the Preschool Language Scale – Third Edition (PLS-3; Zimmerman, Steiner, & Pond, 1992), both being word and sentence-level linguistic assessments, and the Expressive One-Word Picture Vocabulary Test (EOWPVT; Gardener, 1990). Single-word expressive vocabulary tests were popular in a school setting only, yet across the three settings, single-word picture vocabulary tests (receptive or expressive) were a frequent choice. One of the weaknesses of this article was the limited exposure or experience with paediatric TBI by participating SLPs. While the survey targeted clinical settings for paediatric TBI, a high majority of the SLPs only saw a relative proportion of paediatric TBI.

The survey by Frank et al. (1997) also revealed that cognitive assessments, such as the Woodcock-Johnson Psycho-Educational Battery – Revised (WJ-R; Woodcock & Mather, 1989) and academic assessments such As the Detroit Test of Learning Aptitude – 4 (DTLA-4; Hammill & Bryant, 1991), were more frequently used in a rehabilitation setting as opposed to a hospital or school setting. The study also highlighted that there were no differences in tools used based on TBI severity. It also found that the CELF-R (Semel et al., 1987) and PPVT (Dunn & Dunn, 1981) were used for children across the severity continuum. Interestingly, it found that the CELF-R (Semel et al., 1987) specifically was the most popular tool for use earlier in the recovery phase, that being within one month of the injury, particularly in children and adolescents with a mild TBI. SLPs reported that they used the PPVT because it was quick and easy to administer, and the CELF-R because it was both a good indicator of problems and helpful in developing therapy. SLPs acknowledged that neither test was valid or reliable for the TBI population. These tests were used regardless of clinical setting in both inpatient and community settings.

Frank and colleagues (1997) concluded in their study in the USA that SLPs were adhering to ASHA guidelines and using sound clinical practices across various clinical settings, including rehabilitation, schools, and hospitals. This was reportedly because SLPs were using a set of a range of tests, including informal methods that fitted best with the clinical profile of the children. However, conclusions from this study may also highlight the inconsistencies within the SLP profession about test knowledge and its application in clinical practice given the wide variety of tests used in clinical practice. In addition, some concerns were raised with the possible use of CELF-R (Semel et al., 1987) with mild TBI in the acute setting despite not being considered a tool that that would specifically assess deficits common in this

population; that is, mild cognitive and linguistic difficulties at the discourse level. As this survey study was conducted more than 15 years ago, it is important to note whether current practice has changed within this time.

At the time of this survey, there had been very few if any studies looking at standardised assessments in the paediatric TBI population. The CELF-3 (Semel et al., 1995) has been reviewed in a study with school-aged children and adolescents with a TBI since that time, yet that assessment did not highlight strengths and weaknesses even in the more severe TBI range (Turkstra, 1999).

As discussed in relation to paediatric DLI in section 1.9, researcher use of standardised assessment tools can inform current tool selection. Even within the research, there are differences in tools used and there is no agreement on methods employed (Sullivan & Riccio, 2010). Practices surrounding the use of omnibus assessments, as has been mentioned earlier with paediatric DLI in 1.9, highlighted that they are often not completed in their entirety, as with the CELF and its recent editions (Semel et al., 1995, 2003). Researchers often use a single subtest (Hanten et al., 2009; Moran & Gillon, 2004) or a composite of subtests from which a summary score is derived (Docking, Jordan, & Murdoch, 1999; Docking et al., 2000; Liégeois et al., 2013; Turkstra, 1999). Interestingly, these studies do highlight that the CELF assesses general language abilities and does not identify any deficits in communication in the participants used in the study. Significant differences are reported in comparison to normal controls recruited as part of these respective studies.

One-word vocabulary tests have been used both by SLPs and neuropsychologists when evaluating language outcomes, with the PPVT (Dunn & Dunn, 1981) used by both disciplines in research (Chapman, Levin, Matejka,

Harward, & Kufera, 1995; Hay & Moran, 2005; Moran & Gillon, 2004). For measuring language and executive functions, neuropsychologists frequently use verbal fluency tasks (Rabin, Barr, & Burton, 2005). Other assessments, like the Expressive One-Word Picture Vocabulary Test (EOWPVT; Gardener, 1990), Renfrew Bus Story (Renfrew, 1991) and Test of Auditory Comprehension (TACL; Carrow-Woolfolk, 1998), have been used in one study (Morse et al., 1999). In that study, the TACL (Carrow-Woolfolk, 1998) was accurate in distinguishing communication difficulties in children aged three to six who had sustained a severe TBI. Additionally, the TLC-E (Wiig & Secord, 1989) recommended by the ANCDS committee has been used in comparatively fewer studies, with either the entire test (Docking et al., 2000; Hallet, 1997) or subtests (Moran & Gillon, 2004) being used.

Finally, as in paediatric DLI, very little has been documented about assessment tests used to assess literacy after paediatric TBI. Studies by researchers have identified the Test of Written Language (TOWL; Hammill & Larson, 1996) as an assessment comparable to use with children after a TBI (Yorkston et al., 1997), but very little is discussed about assessments used in this area given difficulties with academic skills continue after the TBI (Catroppa & Anderson, 1999).

1.10.1 Summary of assessment practices of SLPs working in paediatric TBI

Similar to paediatric DLI, one-word vocabulary measures and omnibus measures are used in clinical practice in paediatric TBI, but the knowledge of this can only be derived by one study conducted in the USA. Researchers in the area of paediatric TBI use similar assessments, and standardised discourse assessments are not mentioned in assessment protocols.

Interestingly, the CELF (Semel et al., 1987; Semel et al., 1995, 2003) is an assessment used by clinicians and researchers in the area of paediatric DLI and TBI. As mentioned, very little is known about its use in clinical practice, which will be discussed in the next section.

1.11   Clinical Evaluation of Language Fundamentals Fourth Edition (CELF-4)

1.11.1   Overview of the CELF-4

The CELF-4[1] (Semel et al., 2003) is an omnibus measure, which is described as an assessment tool designed to identify and diagnose whether a language disorder exists (Semel et al., 2003). The CELF-4 is designed to follow a step-by-step clinical decision-making process that assists the SLP in making a diagnosis, determining severity of the language disorder, evaluating the child's strengths and weaknesses, and assisting with designing intervention planning and making accommodations within the classroom. It is also regarded as a tool for measuring the efficaciousness of therapy (Paslawski, 2005).

The CELF-4 has 20 subtests and six index scores (refer to Appendix A for a description). Some of the subtests and index scores are new and were added to the latest edition. The CELF-4 has a four-step assessment process, as shown in Figure 1.4. Semel et al. (2003) states that the four-level process can be followed either sequentially or separately and in any order. The assessment process doesn't provide guidance to SLPs to examine individual subtests in isolation, evidence-based practice within psychology assessments would indicate that doing so is not best practice, for it increases possibilities of a false negative or positive (Crowe, 2010;

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[1] The CELF-4 will be referred to repeatedly throughout the rest of this chapter. In order to enhance readability, hereafter the full bibliographic reference will not be provided

Hunsley & Mash, 2011). Nevertheless, the selection of isolated subtests has been utilised in the analysis of language outcomes in both TBI (for example; Hanten et al., 2009; Moran & Gillon, 2004) and DLI (Nash, Hulme, Gooch, & Snowling, 2013), where a comparison or correlation is made with other measures such as working memory. While this may be appropriate in the research arena, it may mislead novice clinicians who may perhaps interpret that a single subtest or collection of subtests is appropriate for use to inform their decision-making process within the clinical context.

Age groups are segmented into four groups comprising 5-8 years, 9 years, 10-12years, and 13-21 years (refer to Appendix A which highlights the age groups for each subtest). Not all subtests are designed to be administered to all age groups though. Subtests overlap across the variety of calculated index scores, and provision is made for these index scores to be compared; (refer to Appendix C).
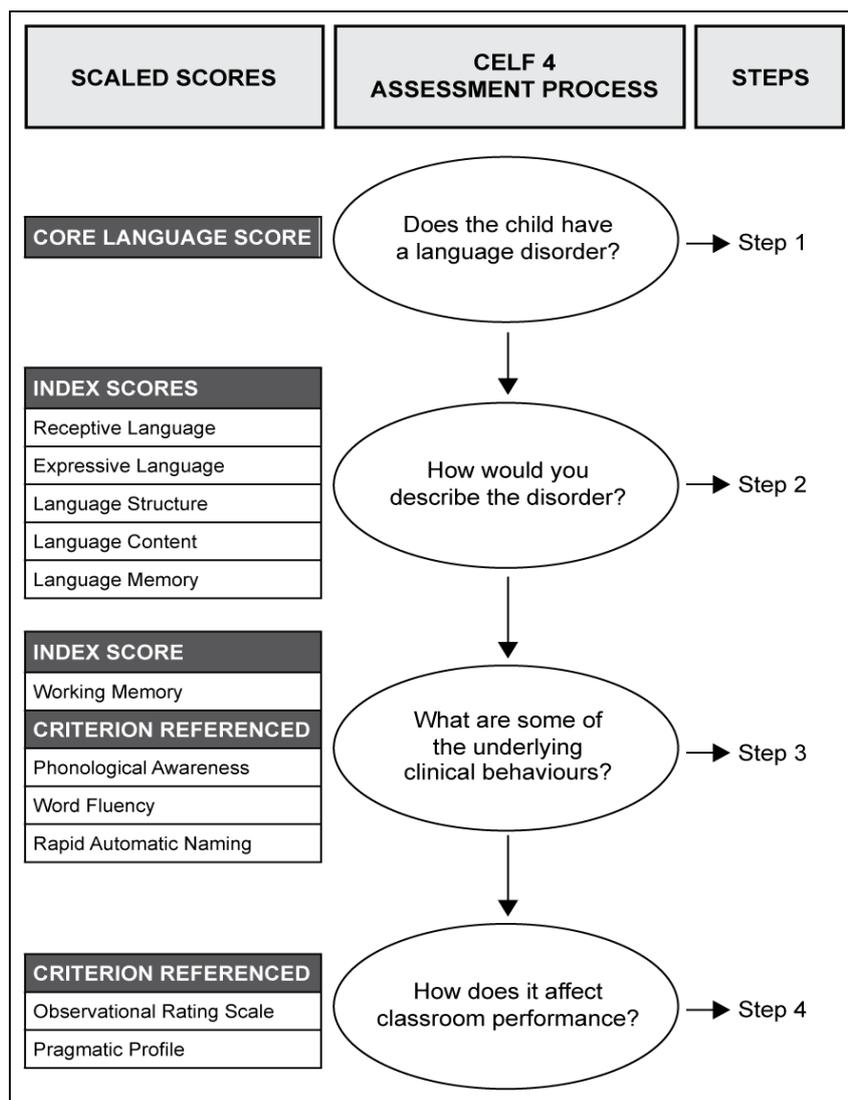
Figure 1.4 Four step process to using the CELF-4 (Semel et al., 2003)

As each index score can include the same subtests in evaluation, this may be viewed as a statistical weakness of the assessment as comparisons of index scores should not be conducted at the index level when similar subtests are shared (Crowe, 2010). That there are also additional supplementary tests allows for the SLP to understand some of the underlying clinical behaviours. These supplementary tests can be used across the span from five to 21 years of age (refer to Appendix B for a description).

The CELF (Semel et al., 1987; Semel et al., 2003) has been described as a test for assessing general language abilities rather than high-level language abilities

(Docking et al., 1999; Docking et al., 2000). Nevertheless, there are within the profession differing perspectives regarding what the CELF is designed to assess. It has been described as an assessment of subtle language difficulties (Semrud-Clikeman, 2001) and discourse processes (Sullivan & Riccio, 2010) although it is considered that such findings relate specifically to individual subtests, such as understanding spoken paragraphs (USP) (Moran & Gillon, 2004) rather than the scope of the assessment tool in its entirety. Specifically, some authors have described the CELF as an appropriate tool for populations of children with a TBI (Blosser & DePompei, 2003) although they fail to provide rigorous supporting evidence to support this. Furthermore, Owens (2014) discusses the limitations of using an assessment that is not normed on a specific population such as TBI, as the CELF is not, and suggests caution be applied to interpretation of results. This feedback can be confusing for SLPs seeking consistent evidence-based guidelines for selecting appropriate assessment tools in clinical practice.

1.11.2 Research studies using the CELF

Test publishers submitted the CELF-3 to the ANCDS committee for inclusion as an assessment for the TBI population when evaluating standardised tests to use with the TBI population. A small number of SLPs reported using it on the paediatric TBI population as part of this workgroup (Turkstra et al., 2005a). However, the CELF-3 was excluded as an appropriate test for use with the TBI population as it did not meet requirements for reliability and validity. Most noticeably, the expressive language component of the tool showed weak construct validity. Studies using the CELF have calculated summary scores such as the receptive, expressive, core, or total language score. Individual subtests such as the listening to paragraphs[2] (LP) subtest have been used in studies as a measure of discourse comprehension, with TBI participants performing within a wide spectrum from within normal limits to significant difficulties (Moran & Gillon, 2004). In other studies, children with autism performed reasonably well with the LP subtest (Lloyd, Paintin, & Botting, 2006). Hanten et al. (2009) used the formulating sentences subtest as a measure of expressive language over a 24-month period on children with mild, moderate, and severe TBI. Whilst significant differences between the three groups of TBI were noted, it was not determined that this would be a useful subtest for use in a clinical application. Turkstra (1999) used the CELF-3 to assess 11 children and adolescents with severity of TBI ranging from mild to severe and were compared to the normative sample outlined in the CELF-3 manual. The outcomes of Turkstra's (1999) study concluded that the test did not assist in revealing strengths and weaknesses in the communication profile of the child or adolescent and intercorrelations amongst the

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[2] Listening to paragraphs subtest in the CELF-3 was renamed to understanding spoken paragraphs when the CELF-4 was published.

subtest standard scores did not differ from the normal sample. Over half of the group had language scores within the normal range, however, the recalling sentences and semantic relationships subtests saw the highest number of children or adolescents obtain a score below the mean, with the other subtests above the mean. That there was a mix of mild to severe TBI participants in this study makes it difficult for making accurate comparisons about the tool.

As mentioned above, variation in results has also been shown in other paediatric TBI studies (Docking et al., 1999; Docking et al., 2000), where the TBI group was reported to perform significantly differently from the control group. Whilst the TBI group did perform significantly differently, their performance was still within the normal range when compared to normative data. Nevertheless, this weakness of the tool should not be specific to the TBI seeing as how other DLI populations also have variation in performance (Webster et al., 2006) and results can vary between test versions (Ballantyne, Spilkin, & Trauner, 2007). In addition, normal controls have had wide variability in individual subtests scores and are acknowledged as a potential weakness of the test (Turkstra, 1999).

Two studies conducted in different countries with a varying cohort of children have compared performance between the CELF-3 and 4 with healthy controls to investigate language skills in children with Rolandic Epilepsy. Results were interesting. Participants tested in the study with the CELF-3 performed within the normal range on receptive and expressive summary scores (Northcott et al., 2005). Participants in the study on the CELF-4 also performed within normal range on core, and expressive language scores, but lower scores were reported on the language content and receptive language summary score. The Language content summary score is derived from new subtests added from to CELF-4 yet not included in the

CELF-3 (Overvliet et al., 2013). This summary score specifically assessed semantic processing This is interesting as it may highlight the usefulness of these additional subtests in detecting subtle or high-level language difficulties as it included new subtests such as receptive and expressive word classess and word definition subtests. If these children had been assessed just on the CELF -3 then these additional difficulties may not have been identified. It is possible the new CELF-4 may have additional subtests relevant for use in clinical practice when an assessment beyond general language abilities is required. However, this has not been substantiated in studies.

No studies have investigated either how the CELF-4 is used in clinical practice or the perceptions of the SLPs who use it. Studies by researchers would indicate that the core language, receptive language, and expressive language are the important summary scores to be tabulated, but there are now additional language, cognitive, and observational measures that the SLP can use. If evidence-based practice were utilised for DLI and TBI, then pragmatics, context, and communication environment would be important aspects in an assesment. The CELF-4 now has measures to incorporate this into clinical practice. If the new subtests and supplementary tests of the CELF-4 (refer to Appendix A, B and C for list) assess semantic processing, pragmatics, or working memory, these should then be more appropriate areas of the test to target for a child with a TBI. However, in current practice, it is unknown as to whether any of these new measures are used with the TBI population. Not all language tests are the same, and not all subtests are equal in difficulty (Sullivan & Riccio, 2010). Additionally, standardised language tests such as the CELF-4 (Semel et al., 2003) have been criticised as subtests that claim to assess grammar or syntax without actually assessing those specific areas; rather,

they assess other cognitive processes, specifically working memory (Archibald, 2013). This review will now discuss how the complexity of the subtest task and working memory loading of the tasks are relevant in assessments of children with a TBI or DLI using the CELF-4 (Semel et al., 2003).

1.11.3 Complexity of task and role of working memory on the CELF-4 subtests

As previously discussed, working memory (WM) is often affected in adults and children after a TBI and also presents in children with a DLI. Owens (2014) suggests that WM is an important aspect for SLPs to asses given its role in language acquisition and that the contribution it makes has received much more focus in the recent decade in speech pathology (Montgomery et al., 2010). WM is a cognitive process that involves the simultaneous action of storage and manipulation of information involved in tasks such as learning, language comprehension, reading, and reasoning (Baddeley, 1997). Additionally, language tasks are impacted by WM loading (Archibald, 2013), and studies have looked at this on various language tasks, specifically those targeted by the CELF. Subtests from the CELF-4, which researchers identify as having a contribution from WM, include understanding spoken paragraphs (Montgomery et al., 2010; Moran & Gillon, 2004), recalling sentences (Archibald, 2013; Hesketh & Conti-Ramsden, 2013), concepts and directions, word classes (9-21yrs subtest), and formulating sentences (Montgomery et al., 2010). However, only one study by Turkstra (1999) has asked SLPs to rate the WM loading of individual subtests from the CELF-3 (Semel et al., 1995). In that study, SLPs were asked to rate WM storage and WM processing separately. There was much variability from the SLPs in ranking the subtests in processing, and they noted how hard the task was. The variation may also possibly indicate SLPs' lack of understanding of WM and its relationship to a task. Interestingly, the RS subtest was ranked highest on storage but lowest on processing. RS has been referred to as a test measuring working memory, one on which a child with a TBI performs well (Ewing-Cobbs & Barnes, 2002) yet a child with a DLI performs more poorly (Conti-

Ramsden et al., 2001). There is conflicting opinion within the literature about whether RS is actually a real test of WM (Okura & Lonsdale, 2012), possibly because it is not a task high in storage demand and processing demand, and this requires further investigation. In the study by Turkstra (1999), semantic relationships and sentence assembly were ranked higher for processing and, as emphasised by Marton and Schwartz (2003), the more sentence complexity, the more WM. As concurred thereafter by Moran and Gillon (2004), if a task has a high WM demand, then the person with a TBI is more likely to have difficulty with that task.

Semel et al. (2003) have included a non-linguistic WM subtest in the CELF-4 using digit span and sequencing tasks to measure WM. They have also included a language memory summary score, which they define as tasks applying WM to aspects of language content and structure (p. 108). However, there remains the question of whether SLPs use these new aspects of the CELF-4 and which subtests on the test SLPs see as more difficult for children with TBI or DLI as well as whether these subtests correspond with their perceived WM loading for the task.

1.11.4   Summary of the CELF-4

The CELF-4 (Semel et al., 2003) is a tool often used by SLPs in paediatric TBI and DLI. While many subtests, summary scores, and observational checklists can be used, there is no study identifying how they are used in clinical practice. The perceptions of SLPs using the CELF-4 have not been documented, nor has it been documented whether the CELF-4 is used differently with children with a DLI as opposed to a TBI. The subtests differ in what they target, their perceived difficulty, and their perceived WM loading. Identifying whether an SLPs' understanding of the test influences its use within clinical practice has not been examined.

In this final introductory section, the thesis will review informal methods of assessment within the three clinical groups.

1.12 Discourse assessment

1.12.1 Overview of approaches to discourse assessment

Discourse is defined as connected speech conveying thoughts and meaning (Cook et al., 2007). Although it can be either spoken or written, spoken discourse is the focus within this section of the study. Discourse is an important component of any clinical assessment of language and cognitive communication as it highlights how the adult or child functions in a real-life context (Coelho et al., 2005b). It is a sensitive measure for identifying subtle cognitive and linguistic difficulties both in adults and children with a TBI (Turkstra & Kennedy, 2005), yet it is often underutilised in clinical practice (Coelho, 2007).

Discourse can be assessed using a formal standardised assessment or via informal methods of assessment derived by the clinician. Compared to word and sentence-level standardised assessments, there are far fewer adult or paediatric standardised discourse assessment tools. It is in the discourse field that informal or non-standardised assessment procedures are frequently discussed (for example; Coelho et al., 2005b; Van Leer & Turkstra, 1999) to evaluate discourse abilities.

Studies examining assessment practices in adult and paediatric TBI have discussed observation as an informal task to evaluate discourse (Frank & Barrineau, 1996; Frank et al., 1997). Unfortunately, these studies do not elaborate on how the task is conducted or whether measures are used or an observation or judgement on the task is merely made. In a study surveying SLP practice (Caesar & Kohler, 2009) in the assessment of discourse in school age paediatric DLI, the frequency of

discourse assessment conducted was compared with the practices of SLPS working with preschool or high school students. The preferred task across all age groups was language sampling and observation, but in comparison, the use of language sampling or observation was used significantly less with school-aged children. In this study, standardised discourse assessment was either rarely or never used (Caesar & Kohler, 2009).

Studies examining the measures used to assess discourse by SLPs working in DLI have focused on preschool children (for example see; Kemp & Klee, 1997). In a recent study examining discourse assessment with school-aged children, a language sample was short, not recorded, and assessed informally during the assessment (Westerveld & Claessen, 2014).

In adult TBI, pragmatic skills, the use of language appropriately in a social situation (McDonald, Togher, & Code, 2013) forms an important component of the discourse assessment in addition to linguistic measures to examine content, interaction, context, and function (Armstrong, 2005; Jorgensen & Togher, 2009; Lê, Mozeiko, & Coelho, 2011; Togher, 2001). By contrast in school age TBI or DLI, the focus has been on linguistic measures (Chapman, 1997), and more so in the preschool years or later years such as adolescence that pragmatic skills form part of a discourse assessment in the literature. The reason for this gap has not been evaluated, but it is likely that the trajectory of social skills development at primary school is varied and continually evolving. Therefore, there is a focus on oral language competency as opposed to social communication, which becomes more important in the formation of peer relationships in adolescence (Mok, Pickles, Durkin, & Conti-Ramsden, 2014). Nevertheless, what the SLP decides to measure will depend on the genre or task used.

1.12.2   Genres used to assess discourse

Essentially, discourse can be assessed as a monologue, conversation, or interaction (Lê et al., 2011), all of which come with positive and negative aspects. In adult and paediatric TBI and paediatric DLI, narratives are frequently used monologue tasks, and many studies have examined narrative discourse skills and deficits across the three clinical groups (for example; Chapman et al., 1992; Gillam, Peña, & Miller, 1999; Jorgensen & Togher, 2009). Even within the literature, however, there is much variability in the tasks used to assess narrative, and multiple different approaches result in different measures, including discrete micro-linguistic measures (Coelho, Grela, Corso, Gamble, & Feinn, 2005a) or macrostructural measures such as gist or coherence (Chapman et al., 2004).

One of the strengths of narrative is that there are developmental milestones and expectations for a narrative in children, so, fundamentally, the SLP does have a reference point to guide them (Owens, 2014) and there are some assessments on the market that target this genre. This is not always the case though with other genres. Studies using procedure (Snow, Douglas, & Ponsford, 1997), exposition (Scott & Windsor, 2000), description (Strauss Hough & Barrow, 2003), and persuasion (Moran, Kirk, & Powell, 2012) amongst others have not had as much research conducted on them and very little formal assessments are developed to assist with identifying specific benchmarks. Furthermore, many studies that examine these types of genres in discourse do so with a control group in order to make comparison. In a real-life clinical context, this may not be helpful to the SLP; unless a clinician is competent with the genre, they may not have the skills to make a

judgement on the individual's discourse abilities without data. Given variation in discourse abilities between normal populations and individuals with a TBI, the problem arises as to how an SLP can justify forming an opinion on the individual's discourse abilities (Body & Perkins, 1998), something not yet explored. Additionally, some genres are more complex than others, and children therefore learn to use different genres at various stages of development. As an example, an exposition would be described as more difficult than a narrative. Evidence suggests that one context or genre should not be relied upon to make an interpretation of an individual's performance, something that has been mentioned in literature in all three clinical groups (Coelho et al., 2005b; Owens, 2014; Togher, 2001).

This leads to the second type of task to assess discourse: conversation or interaction. TBI has been shown to impair conversation (Bogart, Togher, Power, & Docking, 2012). Discourse can be evaluated from a linguistic perspective and/or a pragmatic perspective, which has a focus on the interaction skills between the person and partner. It is important for SLPs to understand that cognitive demands of a task can fluctuate depending on what they are speaking about and whom they are speaking with (Togher, 2000; Togher, Hand, Code, & McDonald, 1999). The way a conversation is elicited and the topic used can impact on the outcome of the discourse (Van Leer & Turkstra, 1999), such as discussing a personal topic as opposed to a current event. Additionally, the familiarity of the listener to a person being assessed or the role that the listener plays in the individual's life, be it clinician, friend, parent, teacher, or employer, can impact on their interaction. Moreover, the influence of hierarchical power within the interaction can impact on the quality of discourse content (Damico & Ball, 2008) and therefore not provide the SLP a true overview of the individual's communication skills. Rather, it may reflect more of an

interview style than conversational dialogue (Bernicot & Dardier, 2001; Togher et al., 1999). One recent study by Westerveld and Claessen (2014) surveyed SLPs across Australia about the language sampling techniques used in clinical practice. The tasks used in preschool years focused on more free play, while with school aged children, SLPs used conversation and story retell. The authors of this study did not critique the use of conversation in this age group, focusing more on the efficacy of personal narrative use in language sampling in the adolescent population. Further information about how conversation was initiated by the SLPs was not discussed. Additionally standardised measures used were the Renfrew Bus Story (Renfrew, 1991) which is normed up to 8years of age, but not with an Australian population.

While it is important to understand the genres that can be used to assess discourse, discourse assessment is often not used in clinical practice, so it is important to understand some of the barriers to assessment. This will now be discussed.

1.12.3 Barriers to discourse assessment

Time constraints for transcription as well as analysis have been reported as barriers associated with conducting a discourse assessment (Coelho, 2007; Westerveld & Claessen, 2014). As opposed to standardised assessment procedures where the SLP may only need to transcribe one sentence at a time, the suggested expectation for a discourse sample is that it be approximately 15 minutes in length (Coelho, 2007), recorded, and a transcription be made afterwards. In studies evaluating language sampling techniques by SLPs working with DLI in pre-schoolers, transcribing during the assessment was a popular methodology (Kemp & Klee, 1997). In the assessment of school-aged children, the transcription was not

recorded and only informally assessed online at the time of the assessment (Westerveld & Claessen, 2014).

In both adult and paediatric TBI, language sampling techniques have not been reviewed. Older studies have highlighted that language sampling takes place, albeit rarely, with no specificity provided around the tasks used other than a conversation. Instead, in these studies, observation was noted as a more popular methodology in adult and paediatric TBI (Frank & Barrineau, 1996; Frank et al., 1997). Contrary to a formal standardised assessment where there is some potential to become familiar with the transcription process owing to the task being similar each time, the use of an informal task means that the response is potentially unique each time. Therefore, lack of training in discourse analysis (Coelho, 2007; Kemp & Klee, 1997; Westerveld & Claessen, 2014) has been reported as an additional barrier. Additionally, and maybe most importantly, barriers to discourse assessment are related to interpreting the assessment results to formulate a therapy plan (Coelho, 2007). In spite of there being such variety in the tasks used and analysis that can be conducted, there is very little current understanding about SLP attitudes or perceptions towards what to analyse, assessments to use, confidence in discourse assessment, and understanding of what discourse assessment is.

1.12.4   Summary of approaches to discourse assessment

Discourse can be assessed either formally using a standardised test or informally using observation or a clinician-derived task. Many genres can be used to assess discourse, but little is known about which genres are used preferentially in clinical practice by SLPs working in adult TBI, paediatric TBI, and DLI. Much remains

unknown as to whether discourse assessment approaches vary between countries, clinical experience, or clinical setting.

1.13   Summary of literature review

Language and cognitive communication disorders are unique disorders of communication that should not be treated as a homogenous group with similar assessment tools. The clinical assessment of cognitive communication disorders has a number of purposes, including identifying the presence of a language or cognitive communication disorder; describing the strengths and weaknesses of the adult or child's communication skills; and assisting the clinician, patient, family, or carers to set appropriate goals and intervention plans. The clinical assessment has implications for service delivery; access to services and resources; and longer-term academic, vocational, and social outcomes.

Guidance regarding evidence-based communication assessment tools has been recommended for use in adult TBI and paediatric TBI, yet there has surprisingly been less direction for the assessment of children who present with paediatric DLI. There has also been no study to date that has documented the international assessment practices of SLPs working with these three clinical groups to identify similarities and differences between country, clinical setting, and years of experience. The use of the CELF-4 has been documented in paediatric TBI and DLI, but little is known about how it is used or what the perceptions of the SLPs who use it are. Finally, it is understood that discourse assessment is not well utilised compared to standardised assessments, but little is known about how SLPs go about assessing discourse, genres used, or their attitudes towards their knowledge and application of discourse.

1.13.1   Aims of the study

The study will describe the clinical assessment practices and tools used by SLPs working in adult TBI and paediatric TBI and DLI. The aims of the study are to:

1.   Identify the frequently assessed areas of communication as well as the tools used to assess cognitive communication disorders in adult TBI, acquired language and cognitive communication disorders in school-aged children after a TBI, and paediatric DLI.

2.   Identify the differences between assessment practices of SLPs working in adult TBI, paediatric TBI, and paediatric DLI.

3.   Identify whether factors such as the country the SLP resides in, the clinical setting they work in, or their years of clinical experience impact on their clinical assessment practices.

4.   Describe how the Clinical Evaluations of Language Fundamentals (CELF 4; Semel et al., 2003) is used by SLPs working in paediatric TBI and DLI.

These aims were examined using online survey methodology with SLPs working in Australia, New Zealand, the United Kingdom, Canada, and the United States of America.

1.13.2   Research questions

1.   Is the approach to clinical assessment different between SLPs working in adult TBI, paediatric TBI, and paediatric DLI?

2.   Do the assessment tools change between SLPs working in paediatric TBI and DLI?

3. Do SLPs working in paediatric TBI and DLI use the CELF-4 (Semel et al.,

    2003) differently?

4. What tasks do SLPs use to assess discourse?

5. Do the factors of country, years of experience, and clinical setting impact on

    the clinical assessment practice?

1.13.3   Hypotheses

1. SLPs working in adult TBI focus on functional communication more frequently

    than SLPs working in paediatric TBI and DLI do.

2. SLPs working in paediatric TBI and DLI will use similar assessment tools due

    to the paucity of assessment tools valid for the paediatric TBI population.

3. SLPs working in both paediatric TBI and DLI will use the CELF-4 (Semel et

    al., 2003) in a similar manner with a focus on core language, receptive

    language, and expressive language summary scores.

4. Standardised formal discourse assessments will not be utilised by the majority

    of SLPs working in adult TBI, paediatric TBI, or paediatric DLI.

5. SLPs from countries with clinical guidelines in the area of language or

    cognitive communication will have different assessment practices to those

    SLPs residing in countries where there are no such guidelines.

1.13.4   Overview of thesis plan

Chapter 1 presented an introduction to the topic of assessment practices of

SLPs working across adult TBI and paediatric TBI and DLI. Chapter 2 outlines the

methodology used, including the rationale for the design of the survey as well as the

recruitment process for SLP participants. The results are presented across a number

of chapters, including demographic data of the participants (Chapter 3), assessment practices in adult TBI (Chapter 4), paediatric DLI (Chapter 5), and paediatric TBI (Chapter 6). Results outlining the use of the CELF-4 (Semel et al., 2003) are presented in Chapter 7, and SLP approaches to discourse assessment are provided in Chapter 8. Chapter 9 will provide a synopsis of the discussion as well as clinical implications and directions for future research.

Chapter 2 – Methodology

2.1   Overview of study

This thesis is a comparative study of Speech Language Pathologists (SLPs) internationally using Likert scale survey methodology to describe the assessment practices of language and cognitive communication disorders. It compares SLPs working in three clinical groups: adult rehabilitation after traumatic brain injury (adult TBI), rehabilitation after TBI in school-aged children (paediatric TBI), and developmental language impairments in school aged children (paediatric DLI). The survey was distributed online and was developed using a variety of rating scales and Likert scales as well as additional open-response text boxes. Analysis involved qualitative and quantitative methods to investigate the SLPs' use of commercially available and informal methods of communication assessments. It then gathered SLPs' perceptions of the utility of these communication assessments in clinical practice when describing strengths and weaknesses in the adult or child's communication skills as well as their useability in goal setting and intervention planning. Further survey methodology was used to identify SLPs working in paediatric TBI rehabilitation and developmental language impairments (DLI) on a specific developmental language assessment titled Clinical Evaluations of Language Fundamentals Fourth Edition (CELF 4; Semel et al., 2003), which is generally referred to as a popular assessment tool used by speech language pathologists for a variety of populations (Blosser & DePompei, 2003; Frank et al., 1997; Lloyd et al., 2006; Turkstra, 1999).

2.2   Participants

The target sample of participants consisted of three groups of SLPs from five English-speaking countries. Specifically, Australia and New Zealand were grouped together, the United States of America and Canada were grouped together, and the United Kingdom was the third. Recruited to the study were those SLPs identifying as having current clinical expertise or experience in the following three areas: communication disorders in adults after a TBI; communication disorders in children after a TBI; and communication disorders in children with a developmental language impairment (DLI). SLPs with clinical expertise or experience in DLI were further classified into two participant groups depending on whether they had provided an assessment to a child or adolescent with an acquired cognitive communication disorder after a TBI. This is outlined in Figure 2.1
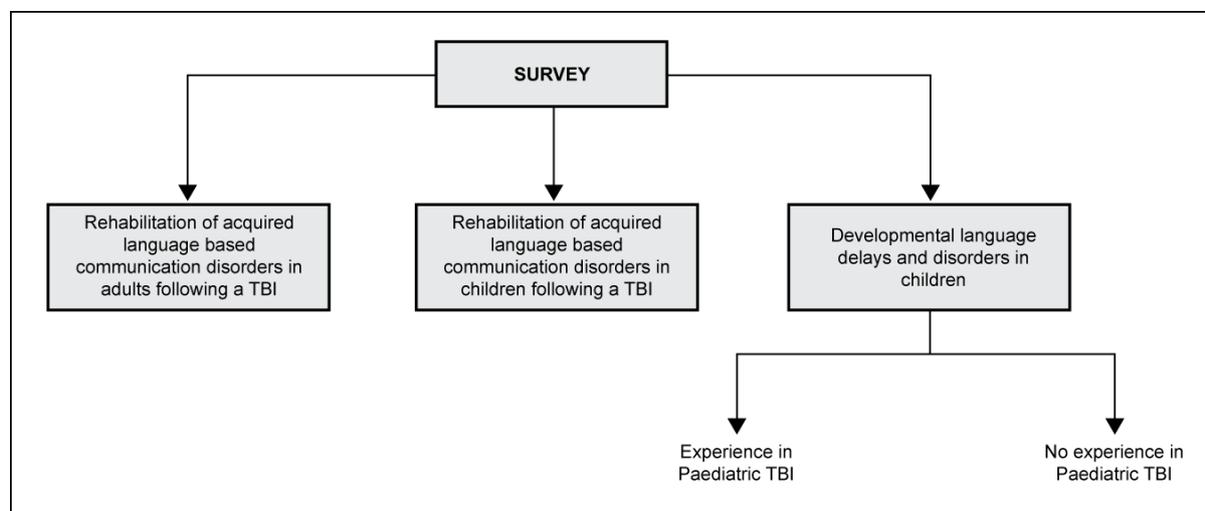
Figure 2.1 Outline of target participants recruited to the study

Sampling frames, or lists from which participants for the study were obtained (Groves et al., 2013), were derived from publicly available SLP databases provided by Speech Pathology Australia (SPA), the New-Zealand Speech-Language

Therapists Association (NZSTA), the Royal College of Speech and Language Therapists (RCSLT) in the United Kingdom, the Canadian Association of Speech Language Pathologists (CASLPA), and the American Speech-Language-Hearing Association (ASHA). All of these databases identified SLPs with specific interest and/or experience in the target area of clinical practice. SLPs listed on these databases were recruited through an individual email invitation that used the SLP's email to participate in the online survey. Users were provided with a personalised link to the survey using Survey Monkey (www.surveymonkey.com). If the names of individuals were available, the emails were then personalised, which is a tactic that has been shown to increase response rate in surveys (Fan & Yan, 2010). A personalised link to the survey also allowed the participant to complete the survey at various times without losing data, which was a strategy employed to increase response rates. In addition, email reminders could also be sent to increase survey participation (Tuten, 2010). The survey was distributed online over a nine month period in 2012. Participants with an email invitation received 3 reminders over a eight week period. The survey took approximately 10 minutes to complete for SLPs working in adult TBI and up to 20minutes for SLPs working in paediatric TBI and DLI.

As highlighted in the Web survey literature, weaknesses in sampling frames include under coverage, causing coverage, and sampling errors (Groves et al., 2013). Risks with coverage and sampling errors in this research study were concerned with SLPs in the three targeted clinical groups not being well represented in terms of clinical setting in their respective countries. One possible issue was that SLPs working in public/government health services might not have had access to the Web survey owing to not being on the publically available databases or the fact that fire wall access to the survey may have been blocked, thereby preventing them from

opening and completing the survey. The sample of participants may also have been be biased with an overrepresentation of one setting of care, particularly private practice as private businesses are more likely to have details on publically available databases aimed at directing the consumer to a clinical service. The aim of the study was to ensure there was representation from various service delivery settings including inpatient rehabilitation, community and outpatient rehabilitation, private practice, and school setting (for SLPs working in paediatric TBI and DLI). Sample frames used were similar to those used by Rose, Ferguson, Power, Togher, and Worrall (2013), who used a Web survey; and to Katz et al. (2000), who used online databases albeit with mail distribution as opposed to online distribution.

Additional sampling frames were identified by accessing speech pathology interest groups in brain injury in the sample countries as well as managers of Speech Pathology departments throughout a number of hospitals and community health centres. The dissemination of the survey was modified using a general Web link using Survey Monkey, an online survey tool. This link was not personalised to any one participant, and an email outlining both the study and survey was sent to moderators of the interest groups and managers of health services asking them to disseminate to staff and/or colleagues. In these cases, the author was unable to control to whom the email link was sent.

The benefits of Web link were evaluated in the context of response rate, sampling, and coverage error. The benefits of an email invitation included both the ability to complete the survey over multiple attempts and to send survey completion reminders to individual participants. On the other hand, a Web link only allowed one opportunity for the participant to complete the survey, and survey completion reminders could not be sent. Web links therefore had the potential to reduce the

response rate and completion rate for the study. Given that this study was international, the ability to distribute to a wider group of SLPs on an international scale outweighed the limitations compared with an email invitation. The Web link also stated that SLPs who had previously completed the survey through a personalised email invitation were not required to complete the survey again, by doing so avoiding duplication and sample error (Tuten, 2010).

Email addresses were not recorded with the survey responses, so a participant's responses were anonymous. Email invitation reminders were sent only three times over an eight-week period because frequent reminders have been shown to increase measurement error and bias with participants not spending the time to cognitively process and provide an appropriate responses (Groves et al., 2013). Web links were disseminated to moderators and managers once with a follow-up reminder to disseminate again one month later.

2.3   Recruitment response rate

Historically, online survey response rates have not been as high as mail or telephone surveys (Fan & Yan, 2010). Coupled with this, there are inherent difficulties in obtaining an accurate response rate when using an open Web link, such as in this survey, because the potential eligibility of target participants is unknown (Couper, 2000). In addition, sample frames using email databases cannot accurately identify eligible participants, which in turn allows for the possibility that SLPs on the databases might not have been suitable for any of the three target SLP groups. For example, an SLP in private practice might say that they have specific interest or skills in paediatric rehabilitation even though they might actually work as a generalist clinician and are thus not the target sample the study was aiming to

recruit. What is more, screening of eligibility could not be done prior to survey dissemination, an uncertainty not uncommon when using database sample frames (Groves et al., 2013).

There are additional complications with calculating response rates. These can include sample frames, such as databases, not being up to date; non-current email addresses; and SLPs potentially having multiple email addresses in the one database. This was the case with the use of the ASHA Web list in which there was a high number of incorrect emails subsequently returned to the author. Overall, 5,604 invitations were sent internationally as part of this study, with 993 (17.7%) emails in the database proving incorrect and 132 (2.4%) respondents clicking on the link in the email to be removed from the email list, thereby opting out. Opting out does not necessarily mean that those SLPs had opted out of this survey altogether; rather, they may have had opted out of receiving any email invitations that were provided by Survey Monkey. This meant 20.1% of the sampling frame did not have access to the survey. These difficulties have been identified as a consequence of the increasing popularity of Web/online surveys. Moreover, as there has been an increase in spamming filters, the likelihood of the email being immediately removed from the target participant's inbox is high, so there is no guarantee that they even received the invitation to participate in the first place (Couper, 2000).

906 participants responded to the survey. Of these, only 26 got as far as answering demographic information, leaving 880 to respond to the rest of the questions. 754 (81.2%) SLPs responded to an email invitation, and 159 (18.8%) responded to the Web link provided. Even though there was an approximate response rate of only 20% from email invitations, it has been documented that low response rates do not always correlate with an increase in response errors (Tuten,

2010). The use of the Web link prohibited an accurate response rate, for the number

of SLPs who received the email to partake in the survey was unknown. A response

rate can be estimated from the Australian SLP population: 686 email invitations were

sent to Australian and New Zealand (AUS/NZ) speech language pathologists, of

whom 243 – 35.4% – responded. Of note, the response rate for SLPs working in

paediatric TBI in Australia and New Zealand was higher than had been expected; as

it had been estimated that there were 32 SLPs in this specialty throughout the ten

major sites in AUS/NZ, the 34 responses to the email invitations therefore exceeded

expectations. In addition, there is a national Australian database from the Speech

Pathology Association of Australia with the details of 153 SLPs with skills in adult TBI

working in a hospital or rehabilitation setting, of whom 63 responded to the email

invitation, equating to a good response rate of 41.2%. The response rate of invited

Australian SLPs working in paediatric developmental language impairment was 144

from an estimated 591 potential participants, providing 26.6% response rate.

Participants from each Australian state were invited to participate, but the response

rate from each state cannot be estimated. Email invitations were sent to 659 email

addresses in the United Kingdom, to which 138, or 21%, responded. However, there

was a high number of British SLPs who emailed the author stating they were unable

to access the survey through their workplace computer, which impacted the

response rate. The lowest response rate was from the United States of America and

Canada (USA/CA) group, but due to the mix of email invitation and Web link

procedures to obtain participants, an accurate response rate cannot be estimated.

The overall low response rate was taken into consideration, and the author

used benchmarking criteria, such as ensuring there was a wide spread of health

professionals working in different clinical environments, to ensure sufficiently

widespread representation. The use of this benchmarking criteria in turn informed the decision not to pursue more participants, which is an approach similar to work discussed by Halbesleben and Whitman (2013) to reduce non-response bias. Not only that, evidence in online survey literature states that response rates can have very little impact on non-response bias (Tuten, 2010).

2.4   Survey content & design

The motivation for the content of the survey, which will be discussed more in depth below, has been described in the introduction and aims of the research. The design of the survey consisted of multiple choice questions, rating scales, Likert scales, and open-ended free text boxes. For copies of the survey disseminated to SLPs, see Appendix E (paediatric TBI and DLI) and F (adult TBI). All SLP participants were asked demographic information using a mixture of question types that allow responses to be categorised into geographical locations such as metropolitan, rural, and/or remote locations as well as country. All this was recorded in a free text box either by the participants, stating the country, postcode, or city they work in. Participants were also provided with six multiple choice answers ranging from less than one year to greater than fifteen years to indicate how many years' clinical experience they had as an SLP. The survey then asked a multiple choice question based on the three clinical groups that were the focus of this study. SLPs were asked to indicate whether they had clinical experience or expertise in the following three caseloads: adult TBI, school-aged paediatric TBI, and school-aged paediatric DLI. SLP experience was restricted to school age because the study wished to focus on specific age ranges and the assessments published in speech pathology generally fell into two categories, those being preschool age and school

age. Widening the response to include preschool would potentially dilute the number of assessments used, thereby making analysis harder to interpret. Furthermore, adolescence was excluded for the reason that service delivery to this group could overlap with intervention for adults, and service delivery for paediatric DLI specifically aimed at the adolescent population could potentially exclude a high number of participants given that it is not an area prioritised in health services (Hollands, van Kraayenoord, & McMahon, 2005). A multiple choice question was then utilised to ask which clinical setting they work in when seeing their clinical caseload. A choice of seven clinical settings was provided, comprising inpatient hospital, outpatient/community rehabilitation, community health/clinic-based services, school-based services, university, private practice, and other.

Following the gathering of demographic information specific to the SLP, the survey was divided into sub-sections depending on the clinical caseload with which individual SLPs had identified. Although these questions focused on assessments used in clinical practice, they differed slightly between clinical groups. SLPs working in adult TBI had a shorter component of the survey, and the progression of the survey for this group is outlined in Figure 2.2. Sections within the survey included areas of communication assessed, assessments used, types of discourse assessments used, and the SLP's perception of discourse knowledge and application in clinical practice. Skip logic on the Survey Monkey software program was used to move the participants to different sections of the survey depending on how they answered the questions.
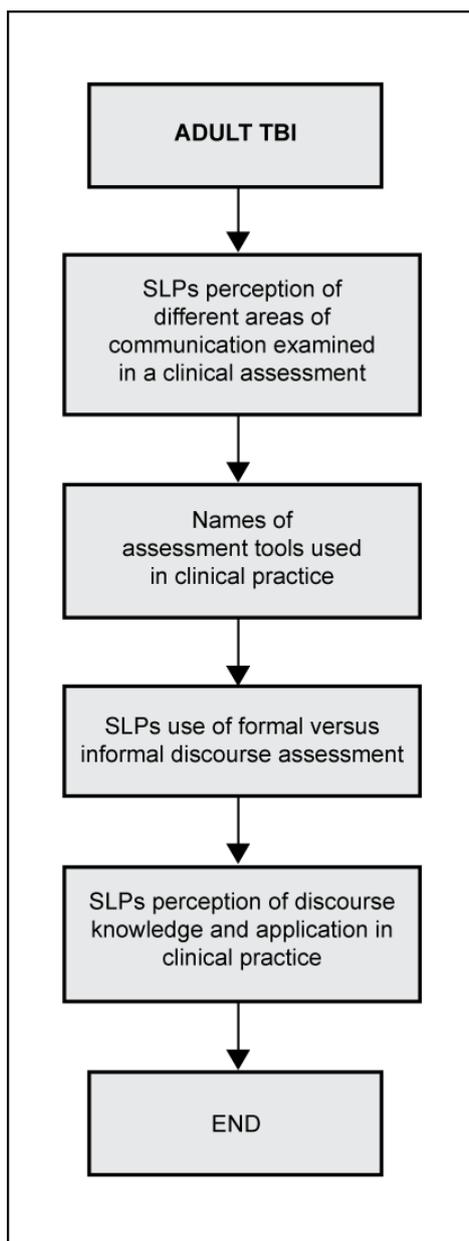
Figure 2.2 Survey Outline for SLP Participants working in Adult TBI

The SLP participants working in paediatric TBI and DLI were asked more in-depth questions than those in adult TBI regarding their satisfaction with different assessments. This was done so that direct comparisons between SLPs working in the two clinical groups could be analysed and presented. The sections included areas of communication assessed, assessments used, SLP satisfaction with assessments, discourse assessments used, and the SLP's perception of discourse

knowledge and application in clinical practice. Some of these questions were designed differently to those concerned with adult TBI, and the Likert scales used to measure responses will be discussed below. See figure 2.3 for a survey outline of the SLP participants working in paediatric TBI and DLI.

Additional information was collected from SLPs who responded in the affirmative to using the Clinical Evaluations of Language Fundamentals (CELF4; Semel et al., 2003). Currently in its fourth edition, the CELF (Semel et al., 1987; Semel et al., 1995, 2003) – along with its variations – is a standardised assessment measuring structural language ability (Cohen, Farnia, & Im-Bolter, 2013). The fourth edition has a four-level assessment process that ranges from identifying whether language disorder or delay exists to describing the disorder, by doing so evaluating both underlying behaviour and language and communication within a context (Semel et al., 2003). Notwithstanding the assessment's popularity in a clinical context for developmental language impairment in the school-aged population (Caesar & Kohler, 2009) and its use in TBI (Turkstra, 1999), very little is actually known about how it is used. Questions were asked to SLP participants both in the paediatric TBI and developmental language group about attitudes towards the CELF's use in clinical practice and what aspects of the CELF are used in clinical practice as well as their opinion of the subtest's complexity or difficulty for their client group. SLPs were asked to rate how likely working memory impacted on each subtest on the CELF with the rationale that working memory influenced the performance on language tasks of an assessment like the CELF (Moran & Gillon, 2004; Turkstra et al., 2005a).
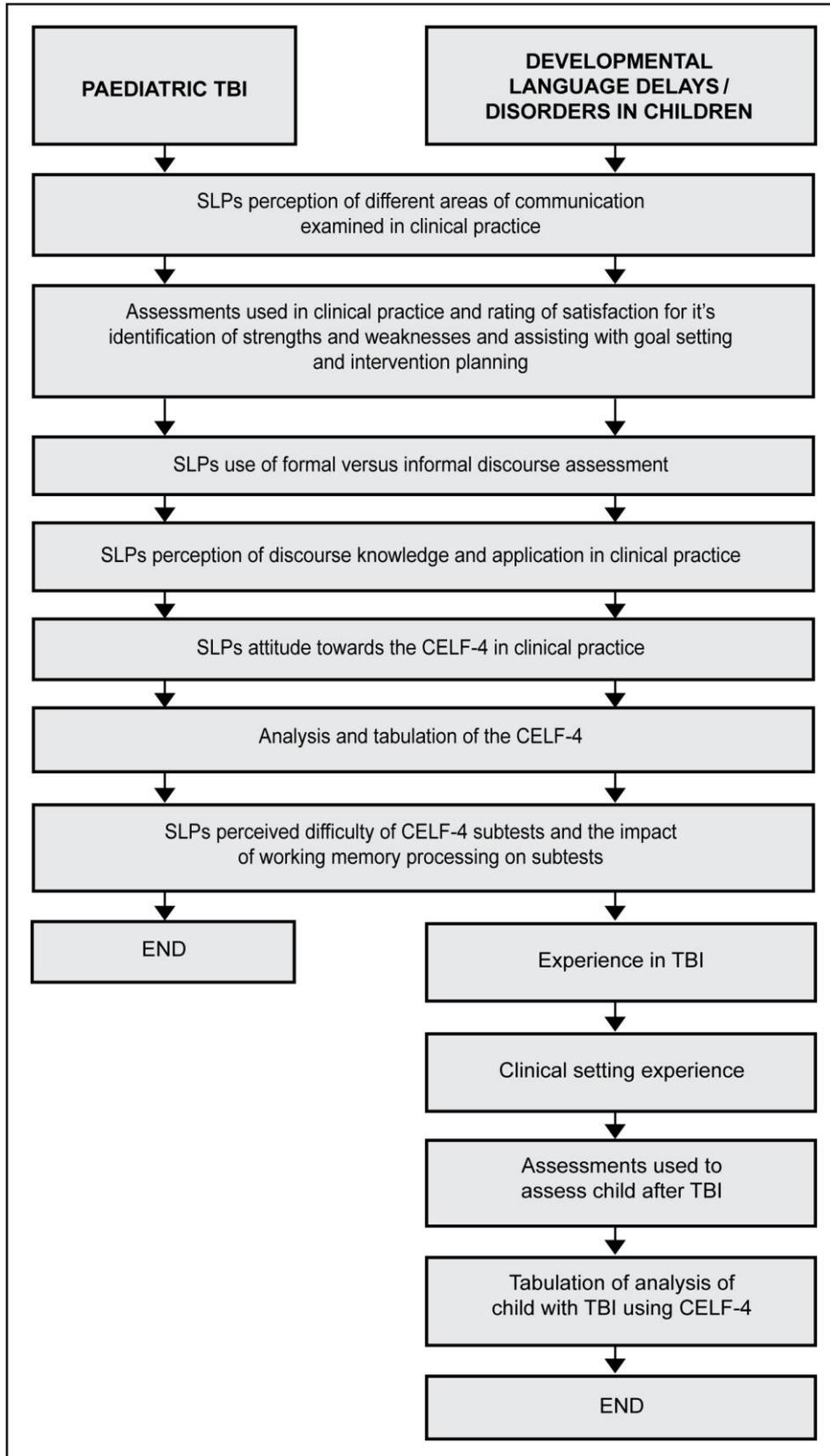
Figure 2.3 Survey outline for SLP participants working in paediatric TBI & DLI

Finally, SLP participants who worked in paediatric DLI were asked if they had had experience assessing a child with a TBI. Regardless of their response, they were subsequently asked what assessments they would use if assessing a child with an acquired cognitive communication disorder after TBI and what components of the CELF-4 (Semel et al., 2003) they would use in clinical practice. The rationale for asking SLPs who worked in DLI what they would use if assessing a child with a TBI, was to identify if their practice or tools used would change for a child with a different communication disorder. A five-point Likert rating scale was used for SLPs to rate how frequently they assessed different areas of communication in clinical practice. Figure 2.4 highlights the areas of communication listed for each participant group. The list of categories was determined based on the factors of clinical experience as an SLP as well as on literature on the characteristics and descriptions of communication difficulties described in adult and paediatric TBI (American Speech-Language-Hearing Association, 2005; Ewing-Cobbs & Barnes, 2002; Hough, 2008) and paediatric DLI (Botting & Conti-Ramsden, 2004; Paul, 2007). There were minor differences in the areas of communication listed across the three clinical groups. For example, phonemic awareness/phonics skills was listed in paediatric TBI and DLI but not in adult TBI as it was generally not an area assessed in clinical practice for adult rehabilitation. The term functional communication was included and it was a general term to encapsulate that the SLP had considered within their assessment the actvities and context that the child or adult participated in and how their communication impairment impacted upon it. This was in keeping with frameworks discussed earlier in section 1.6.
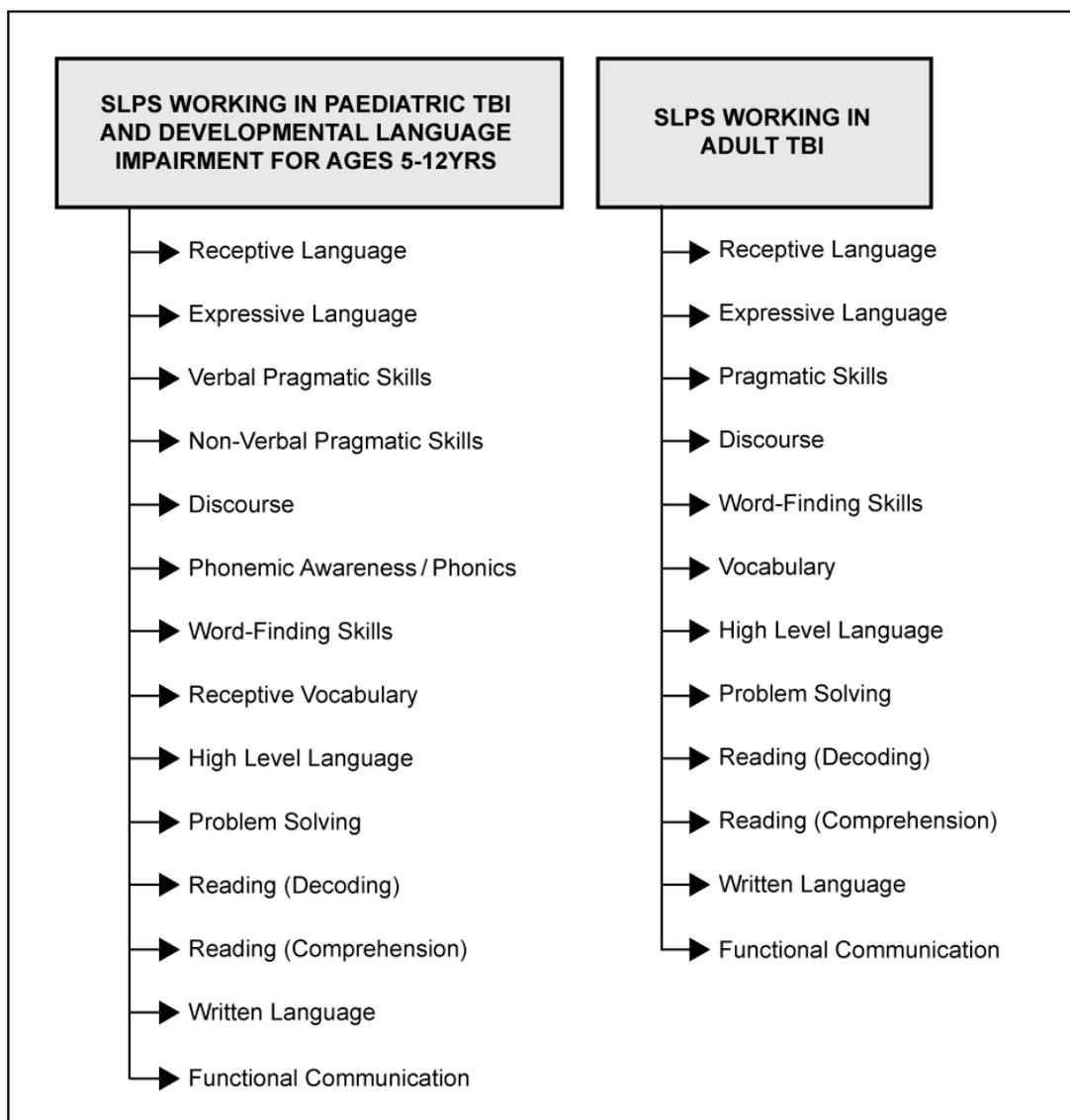
Figure 2.4 Areas of communication assessed by clinical group

Verbal category descriptors were used as anchor points for each interval on the rating scale and ranged from never to majority of the time. This was done so that more reliable quantitative comparisons could be made in the analysis (Hofmans, Theuns, & van Acker, 2009). There are inherent difficulties with participant interpretation about measuring psychological distance on rating scales, and verbal descriptors may be more ambiguous to some responders than to others (Blais & Grondin, 2011). In order to avoid these problems with interpretation in the analysis, a percentage of clinical time was provided as an additional qualifier along with the

verbal descriptors in order to assist the SLP participants in making a more accurate

perceived judgement of their assessment practices. The quantifiers used for clinical

time are highlighted in Figure 2.5.

Never	Infrequent	Somewhat Frequent	Frequently	Majority of the Time
○	○	○	○	○
0% clinical time	<25% clinical time	25% - <50% clinical time	50% - <85% clinical time	>85% clinical time

Figure 2.5 Likert rating scale used in online survey

Participants were then asked about the assessments they use in clinical

practice. These questions were different depending on whether the SLPs worked in

adult TBI paediatric TBI, or paediatric DLI. Those in the adult TBI group were

provided with four text boxes for naming four assessments they used frequently and

found useful both for identifying strengths and weaknesses in a person's

communications skills and in assisting with goal setting and intervention planning.

Those in paediatric TBI and DLI were provided with a list of standardised and/or

norm-referenced assessments that are commonly available in Australia and/or the

United States of America and the United Kingdom. The list of assessments in the

survey is provided in Table 2.1.

Table 2.1 List of assessments rated for frequency of use and satisfaction for paediatric TBI and DLI

Standardised Language Assessment
Clinical Evaluations of Language Fundamentals Fourth Edition (CELF 4; Semel et al., 2003)
100 Picture Word Naming Assessment (HPNT; Fisher & Glenister, 1992)
Children's Communication Checklist 2nd Edition (CCC-2; Bishop, 2003a)
Test of Problem Solving (TOPS; Huisingh et al., 2005)
Neale Analysis of Reading Ability (NEALE; Neale, 1997)
Test of Language Competence (TLC; Wiig & Secord, 1989)
Comprehensive Assessment of Spoken Language (CASL; Carrow-Woolfolk, 1999)
Renfrew Bus Story (RBS; Renfrew, 1991)
Expression, Reception Recall Narrative Instrument (ERRNI; Bishop, 2004)
Test for Auditory Comprehension of Language (TACL-3; Carrow-Woolfolk, 1998)
Test of Written Language (TOWL-3; Hammill & Larson, 1996)
Renfrew Action Picture Test (RAPT; Renfrew, 2003)
School Age Oral Language Assessment (SAOLA; Leitão & Allan, 2003)
Peabody Picture Vocabulary Test (PPVT; Dunn & Dunn, 2007)
Wechsler Wide Achievement Test (Oral Expression Subtest)(OE/WIAT; Wechsler, 2005)

The list of assessments, which was not meant to be exhaustive, included standardised single-word and sentence-level assessments designed to assess general language abilities for developmental language impairments. It also included assessments covering discourse, literacy (reading and writing), higher-order language functions, vocabulary, word-finding ability, and functional communication. The list was derived from clinical experience and previous studies where the tests were either used (for example; Bishop & McDonald, 2009; Webster et al., 2006) or noted as being popular with SLPs (Betz et al., 2013; Caesar & Kohler, 2009; Frank et al., 1997). SLP participants were asked to rate how frequently in clinical practice they used the assessments provided in the list. They were then asked to rate their satisfaction towards the assessment's ability to identify strengths and weaknesses in

the client's communication skills as well as how its ability to assist with goal setting and intervention planning.
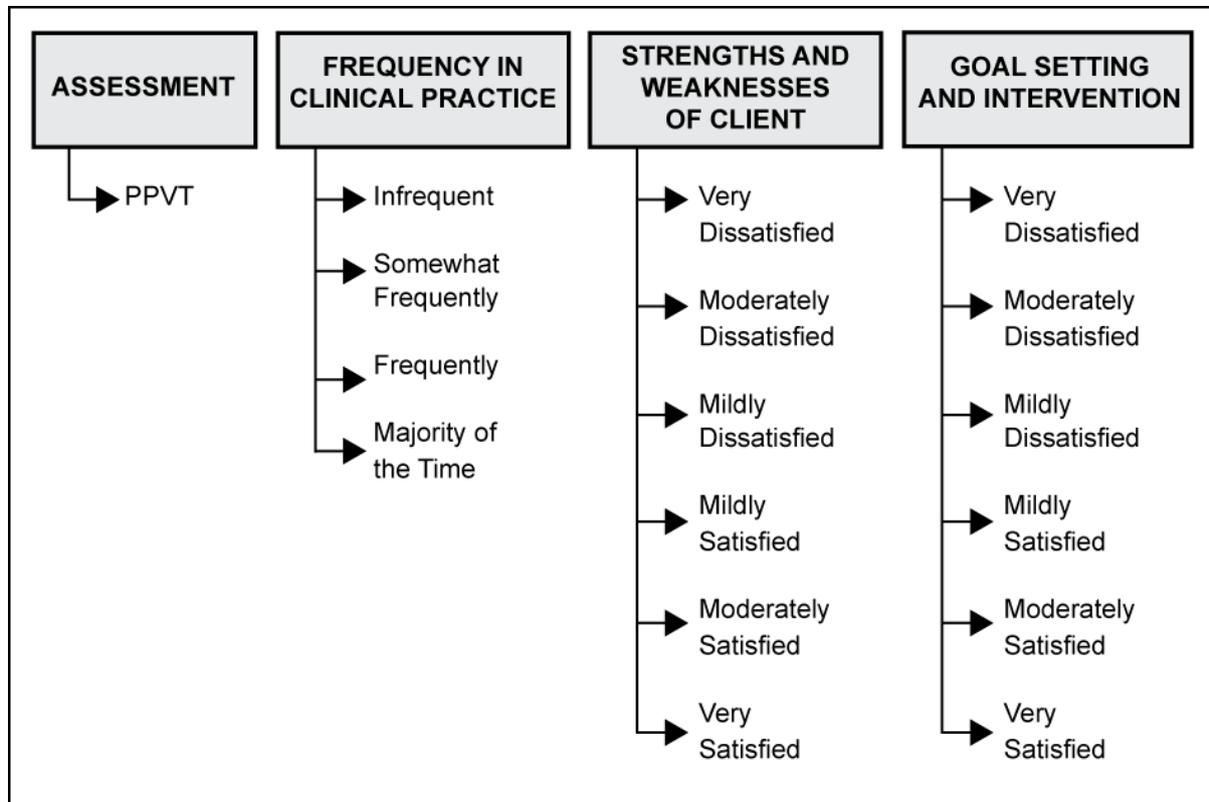
Figure 2.6 Schematic representation of how paediatric assessment question was asked in survey

As shown in Figure 2.6, each assessment had three Likert scale questions that required answering. If the SLP did not use one assessment, they were requested to skip to the next assessment. SLPs were asked to rate the assessments on two questions; its ability to measure strengths and weaknesses in a client's communication skills as well as its ability to assist with goal setting and intervention, because they have been noted as general reasons and principles an SLP is likely to use when deciding upon a particular assessment to use (Turkstra et al., 2005a). To rate their satisfaction, SLPs used a six-point Likert Scale as shown in Figure 2.6.

Moreover, additional descriptor intervals, specifically the moderately agree/disagree interval, were added, which was done based on evidence that having more interval points is more likely to assist with obtaining an accurate perception of an individual who may avoid answering at the extreme ends of the agreement/disagreement (Leung, 2011; Norman, 2010). As it was important to reduce social desirable bias in the sample, a neutral position was not included in the scale. SLPs were therefore forced to choose between agree or disagree. Four free-text boxes were provided so that participants could identify additional assessments that they used frequently and were satisfied with in meeting both criteria; that is, assessments that assist in identifying strengths and weaknesses in the child's communication skills as well as assisting in goal setting and intervention planning.

Questions examining informal and formal approaches to discourse were the same for all three clinical groups. The same frequency rating scale from Figure 2.5 was used. Descriptions of informal discourse assessment and formal discourse assessment were provided in the survey. In this survey, the use of formal assessment involved some form of tabulation or analysis process, while informal assessment referred to a global or general overview of the client's discourse. It has been noted that an analysis of results such as these, which needed to fulfil a formal discourse assessment, can be a barrier (Coelho, 2007), but the study did not wish to exclude potential informal methods of discourse assessment, for example observation, noted as a preferred informal method of assessment in adult TBI (Frank & Barrineau, 1996), paediatric TBI (Frank et al., 1997), or paediatric DLI (Caesar & Kohler, 2009; Hux, Morris-Friehe, & Sanger, 1993; Kemp & Klee, 1997). Genres or tasks used to assess discourse were then asked about using the same frequency rating scale. Nine genres used to assess discourse were provided, comprising:

narrative, procedure, conversation between clinician and client, conversation between client and significant other, description, recount, exposition, argument, and persuasion. These genres were asked about based on a review of the tasks used in studies where the focus had been to assess discourse covering all three clinical groups. Additionally, SLPs were asked whether they assess pragmatic skills as part of discourse.

The six-point agree/disagree Likert scale was used to ascertain the attitudes of SLPs regarding their knowledge of discourse and the application of discourse assessment in clinical practice (see Figure 2.7 for the verbal descriptors of the Likert scale). Statements presented were based on some of the concerns noted by researchers in the field of discourse (Coelho, 2007), and they concerned the time it takes to conduct a discourse assessment, knowledge of discourse assessments, confidence with analysis, and the interest level from other parties in discourse results. A full list of statements in the survey can be viewed in Appendix E and F.

Figure 2.7 Likert rating scale for CELF question used in online survey

Questions about the Clinical Evaluations of Language Fundamentals, Fourth Edition (Semel et al., 2003) were only asked if SLPs working in paediatric TBI and DLI had experience using it. There were four sets of questions looking at the use of the CELF-4 (Semel et al., 2003) questions that were outlined in Figure 2.3. The questions looked at the frequency with which SLPs tabulated the various index

scores and supplementary tests in clinical practice (see Appendix A, B and C for a list of index scores and supplementary tests from the CELF-4). As outlined in Figure 2.1 and 2.3, assessment practices were also examined for SLPs working in paediatric DLI with the same questions asked albeit posed so that they would hypothesise that the child had a TBI. They were then asked to answer the same question again albeit based on assessing a child with an acquired cognitive communication disorder after a TBI. Questions also looked at the SLP's perceived complexity of each subtest in the CELF-4 (Semel et al., 2003) as well as the likelihood of working memory influencing the child's ability to complete the subtest. A definition of working memory from Baddeley (1997) was provided to the SLP participants. The definition used for working memory can be viewed within the survey in appendix B. Verbal descriptors for the rating scale were modified and are shown in Figure 2.8. Finally questions were asked about the SLP's attitudes towards the CELF-4 (Semel et al., 2003). These questions were based around some of the limitations noted about this assessment – or other word and sentence-level developmental language assessment within the literature – including regarding its accuracy in measuring expressive language (Turkstra et al., 2005b) and receptive language; its ability to describe a child's communication outside of the clinical setting/functional communication skills (Bishop & McDonald, 2009); whether it is an assessment you can compare with peers (Owens, 2014); and other factors that may impact on the SLP's decision to use it (Betz et al., 2013). Appendix E provides a full list of statements SLPs were asked to agree or disagree with, and Figure 2.7 illustrates the scale and verbal descriptors used.

Figure 2.8 Likert rating scale for agree/disagree used in online survey

A draft survey, piloted with key SLPs working in the three clinical areas, was developed prior to final dissemination. The SLPs were asked to comment on the language, wording, and comprehension of questions; time taken to complete the survey; and the correct use of Skip logic depending on how they had answered the question. Feedback was obtained, and minor modifications to the survey were duly made. This process was conducted in order to minimise measurement error since wording of questions and clarity of instructions have been shown to affect the response rate (Fan & Yan, 2010).

2.5   Terminology used in survey

The focus of this thesis is on assessment practices of language and cognitive communication. To this end, it was important to specify in the questions put to SLPs beyond communication disorders in the explanation to SLP participants so they would not respond on practices relating to dysarthria, dyspraxia and dysphagia, phonology, or articulation. The term 'cognitive communication' was deliberately not used in the survey; instead, the term 'language-based communication disorders' was used. The rationale for this was to prevent any response bias by SLPs seeing as how the term 'cognitive communication' (for example; Turkstra et al., 2005a) may return a false positive result owing to its links with research involving discourse (for example; Chapman, Levin, Wanek, Weyrauch, & Kufera, 1998) and social

communication (for example; McDonald et al., 2003). This may promptthe SLP to answer less honestly about what they do in clinical practice. In addition, as this was a survey that was to be used to capture assessment practices internationally, it was important to use terminology that would be applicable to all SLPs regardless of the country they work in. Work by Body and Perkins (2006) has highlighted that there is varying terminology to label cognitive communication, particularly with the use of the terms 'higher-level language' or 'higher-order complex language' used in paediatric TBI research (for example; Docking et al., 2000; Moran & Gillon, 2004). The term 'high-level language' is also used, and assessments have used it in identifying what the purpose of the assessment is (for example; Christie et al., 1986; Wiig & Secord, 1989) Furthermore, the term 'cognitive communication' is not widely used in DLI literature or research with terminology focusing around higher-order language (Cohen et al., 2013) or pragmatic language (Bishop & Baird, 2001). The term language-based communication disorders was thus utilised to promote SLPs to think broadly about what aspects of language and communication they assess in clinical practice.

2.6 Analysis of survey results

Responses from Survey Monkey software were downloaded into IBM SPSS: Statistical Package for the Social Sciences version 21 (IBM Corp, Released 2012). Factors for analysis in the study involved country, years of experience, and clinical setting. Countries were characterised into three groups based on the information provided, broken down into country, city, or postcode. The country groups were Australia and New Zealand (AUS/NZ), the United Kingdom (UK), and the United States and Canada (USA/CA). Respondents that failed to identify a country of origin

were excluded from quantitative analysis. Years of experience was characterised

into either ten years and less (≤10years) or greater than ten years (>10years).

Clinical setting was characterised into two groups: inpatient setting (acute/

rehabilitation); and community setting, compromising outpatient/community

rehabilitation, community health/clinic-based services, school-based services

(paediatric TBI or DLI only), and university. Where 'other' was recorded as the

setting, it was either coded dependent upon what was in the text box describing

'other' or automatically categorised as a community setting. The choice to categorise

into two larger groups was based on the need for statistical power for quantitative

analysis as well the scope of the study not being to look at individual settings of care.

All questions that evaluated frequency and used the scale from Figure 2.5 had

responses recoded in four categories with never, infrequently, frequently, and

majority of the time/routinely. The responses 'somewhat frequently' and 'infrequently'

were condensed into 'infrequently'. The rationale for this was to reduce the amount

of comparisons that could be made. Also, given the fact that respondents had the

opportunity to indicate between greater than 50% of clinical time and less than 50%

of clinical time, choosing less than 50% was a likely indication that it was not a major

component of clinical practice.

All questions that evaluated agreement and disagreement and used the scale

from Figure 2.8 were condensed into four-point scale. As extreme points of view

such as strongly agree or disagree are sometimes less likely to be answered (Leung,

2011; Norman, 2010), moderately and strongly agree/disagree were combined. It

was felt that moderately agree or disagree highlighted some level of commitment to

the statement whereas mildly agree/disagree indicated some level of hesitation to

the statement, so they were evaluated separately. This analysis and rationale was

also conducted with the scale used in Figure 2.7, with definitely and very likely combined, never and very unlikely combined, and somewhat unlikely and somewhat likely evaluated separately.

A high number of assessments were reported by the SLPs working in adult TBI. Because of this, a classification system was developed based on the Simmons-Mackie and colleagues study (Simmons-Mackie et al., 2005), which categorised assessments into linguistic/cognitive, functional, subjective/qualitative, and vague/other. In this study, these categories were broadened to include aphasia assessments, cognitive communication/high-level language assessments, cognitive/neuropsychology assessments, assessment of functional performance (including literacy), informal language and cognitive assessments, naming and word-finding assessments, discourse and/or pragmatic skills assessments, and other. As a result of responses from SLPs working in paediatric TBI and DLI, assessments were categorised based on expert opinion from five SLPs working in the area of traumatic brain injury, aphasia and developmental language impairment. However, the assessments were modified with the exclusion of aphasia assessments and the addition of developmental language and literacy/phonemic awareness assessments. Literacy was excluded from the assessment of functional performance category for paediatric TBI and DLI as the types of literacy assessments used with children were not a measure of functional skills.

A Chi-Square analysis was conducted. This analysis is recommended for categorical and ordinal data (Howell, 1995) to examine factors such as country, years of experience, setting of care, and differences between or within clinical groups, adult TBI, and paediatric TBI and DLI. To ensure reliable Chi-Square tests, both a Pearson Chi-Square test as well as the Monte Carlo exact test options were

completed when guidelines such as small sample sizes were broken for a reliable Chi-Square (Agresti, 2010). A P value of <.05 was desired with a Monte Carlo exact test. When there was a significant result from Chi-Square analysis, an adjusted residuals test was carried out in order to determine which component of the analysis was the strongest contributor to the Chi-Square test (Hosmer Jr, Lemeshow, & Sturdivant, 2013). Residuals exceeding +/- 2 in the analysis were discussed in the results as strong contributors.

The next chapters will provide results of the assessment practices of SLPs working in adult TBI, paediatric TBI, and paediatric DLI. The results of SLPs working in paediatric TBI and DLI and their use of the CELF-4 (Semel et al., 2003) will be presented. This will be followed by an analysis of formal and informal discourse approaches of SLPs in all three clinical groups.

Chapter 3 – Results

3.1   Introduction

The present chapter (Chapter 3) presents an overview of the survey respondents. The following three chapters will explore the assessment tools used by speech language pathologists (SLPs) working in adult traumatic brain injury (TBI) (Chapter 4), paediatric developmental language impairments (DLI) (Chapter 5), and paediatric TBI (Chapter 6). The subsequent chapter (Chapter 7) will then focus on the use of one specific paediatric standardised tool, the Clinical Evaluations of Language Fundamentals Fourth Edition (CELF 4; Semel et al., 2003), and compare the use of application in clinical practice by SLPs working in paediatric TBI and DLI. The final results chapter (Chapter 7) will examine the informal and formal discourse approaches in clinical practice by SLPs working in the three clinical groups. Before these findings are reported, the demographic information collected relating to SLPs will be examined in the current chapter (Chapter 3) to identify similarities or differences between those working in the three clinical groups and the factors country of work place, years of experience, and setting of care.

3.2   Demographic information

880 SLPs responded to the survey. Within the target groups, 30.1% (n=265) comprised SLPs working in adult TBI; 58.9%, (n=518) were SLPs working in paediatric DLI; and 11% (n= 97) were SLPs working in paediatric TBI. As highlighted in Table 3.1, the majority of SLPs worked in metropolitan centres. SLPs from the United States and Canada (USA/CA) made up the largest group in adult TBI and paediatric DLI; SLPs from Australia and New Zealand (AUS/NZ) compromised the

largest group in paediatric TBI; and SLPS from the United Kingdom (UK) made up the smallest proportion across all clinical groups. With adult TBI, there was an even distribution of SLPs working in both inpatient and community settings, whereas with paediatric TBI, a slightly larger proportion of SLPs worked in a community setting. SLPs working in paediatric DLI mainly worked in community settings.

Community settings consisted of a number of areas. Adult TBI comprised clinicians working in outpatient and community rehabilitation facilities (56.5%), private practice (17.6%), and university clinics (14.5%); paediatric DLI comprised outpatient and community health settings (23.8%), school-based settings (30.4%), private practice (38%), and university clinics or other (5.5%); while paediatric TBI comprised community rehabilitation and community health settings (22.7%), school-based settings (4.1%), university clinics or other (8.3%), and private practice (23.7%). The majority of SLPs across all clinical groups had experience of greater than 10 years.

Results of the interaction between the clinical groups on the one side and the factors of geographical location, country, clinical setting, and years of clinical experience on the other were tabulated. There was a significant relationship between geographical location and SLPs from adult and paediatric DLI, whereby SLPs with more years of experience were more likely to work in metropolitan settings and SLPs with less experience were more likely to work in rural and remote areas (see Table 3.2).

Table 3.1 Speech Language Pathologists (n= 880) demographic Information

	SLPs responses (n) Percentage of SLPs (%)		
	SLPs Adult TBI	SLPs Paediatric TBI	SLPs Paediatric DLI
Geographical Location			
Metropolitan	210 (79.2%)	81 (83.5%)	385 (74.3%)
Rural & Remote	55 (20.8%)	16 (16.5%)	133 (25.7%)
Country			
Australia / New Zealand	81 (30.6%)	39 (40.2%)	157 (30.3%)
USA / Canada	113 (42.6%)	36 (37.1%)	310 (59.8%)
United Kingdom	69 (26.0%)	21 (21.6%)	44 (8.5%)
Unknown		1 (1.0%)	7 (1.4%)
Clinical Setting			
Inpatient Hospital	134 (50.6%)	40 (41.2%)	12 (6.5%)
Community	131 (49.4%)	57 (58.8%)	502 (97.7%)
Years of Experience			
≤10yrs	121 (45.7%)	32 (33.0%)	191 (36.9%)
>10yrs	144 (54.3%)	65 (67.0%)	327 (63.1%)

Table 3.2 Comparison of geographical setting with years of experience for adult TBI & paediatric DLI

Clinical Group	Geographical Setting	Years of Experience		p Value
		≤10yrs	>10yrs	
Adult TBI	Metropolitan	41.8%	58.2%	$\chi2$ (1, n=263) = 7.0, p=.008
	Rural & Remote	61.8%	38.2%	
Paediatric DLI	Metropolitan	34.7%	65.4%	$\chi2$ (1, n=511) = 4.42, p=.04
	Rural & Remote	45.0%	55.%	

There was also a relationship with SLPs working in DLI: clinicians from AUS/NZ represented a higher proportion of SLPs in rural and remote areas and

those from USA/CA represented a higher proportion of those in metropolitan areas (see Table 3.3).

Table 3.3 Comparison of country and geographical setting for paediatric DLI

Clinical Group	Geographical Location	Country (% of use)			p Value
		AUS/NZ	UK	USA/CA	
Paediatric DLI	Metropolitan	26.6%	7.4%	66.1%	χ2 (2, n=511) = 18.04, p<.001
	Rural & Remote	42.7%	12.2%	45.0%	

Table 3.4 Comparison of clinical setting and years of experience for adult TBI and paediatric TBI

Clinical Group	Clinical Setting	Years of Experience		p Value
		≤10yrs	>10yrs	
Adult TBI	Inpatient	57.9%	42.1%	χ2 (1, n=263) = 15.31, p<.001
	Community	33.8%	66.2%	
Paediatric TBI	Inpatient	59.4%	40.6%	χ2 (1, n=96) = 6.20, p=.013
	Community	32.8%	67.2%	

There was also a significant relationship with SLPs working in adult and paediatric TBI, with less-experienced SLPs more likely to work in an inpatient setting than a community setting (see Table 3.4). In addition, when examining all three variables, only SLPs from USA/CA were more likely to have more years of experience and work in a community setting for adult TBI (χ^2 (1, n=113) = 12.84, p<.001) and paediatric TBI (χ^2 (1, n=36) = 4.80, p=.029).

3.3   Summary

SLPs from USA/CA made up the largest group of respondents in adult TBI and paediatric DLI, whereas SLPs from AUS/NZ made up the largest group in paediatric TBI. A high proportion of SLPs in AUS/NZ working in paediatric DLI

worked in rural and remote areas, while a high proportion of those from USA/CA worked in metropolitan centres. Generally, SLPs working in rural and remote areas had less than 10 years' experience; similarly, SLPs working in an inpatient setting generally had less than 10 years' clinical experience as well. Chapter four will now examine the assessment practices of SLPs working in adult TBI.

Chapter 4 - Results

Assessment Practices of SLPs Working in Adult TBI

4.1 Areas of communication assessed in clinical practice

SLPs who worked in adult Traumatic Brain Injury (TBI) were asked to rate how frequently they assess different areas of communication in clinical practice. Functional communication skills were the most routinely assessed area of communication, followed by receptive and expressive language. Most areas of communication were reported to have been routinely assessed within clinical practice. However, discourse, reading (decoding and comprehension), written language, and vocabulary varied in responses. Indeed, some SLPs reported that they infrequently assessed these areas of communication (see Figure 4.1).
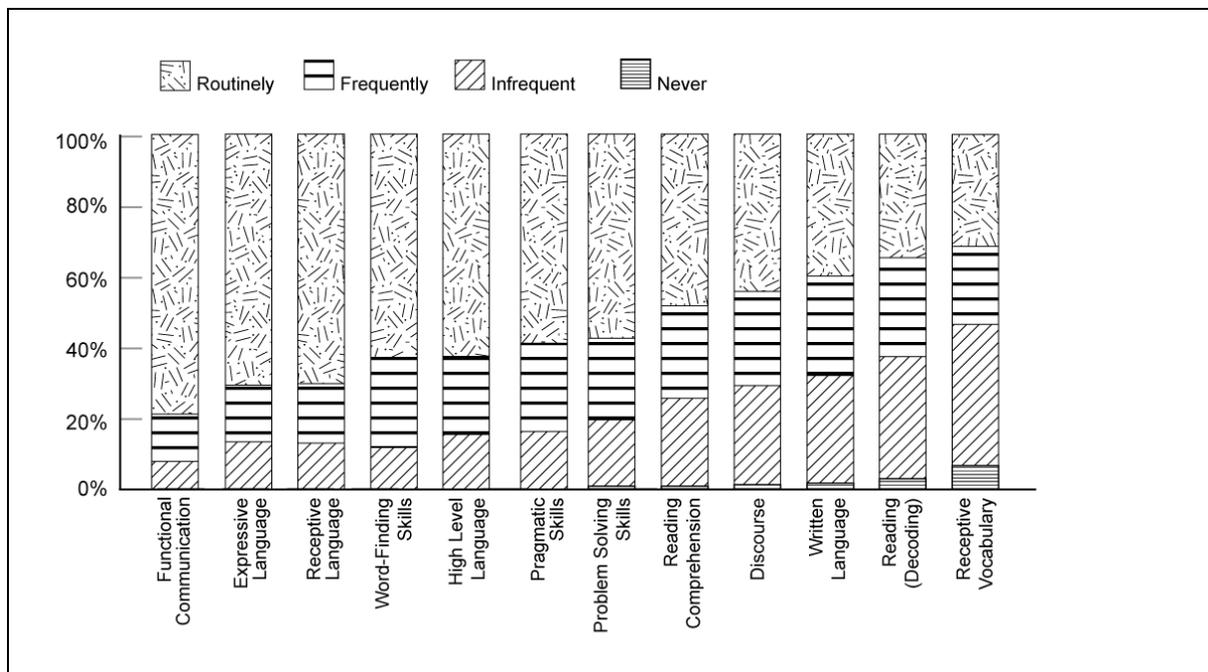
Figure 4.1 Areas of communication assessed in adult TBI in order of frequency

4.2   Factors influencing areas of communication assessed

SLPs who worked in adult TBI from different countries (AUS/NZ, USA/CA, and UK) assessed different aspects of communication more frequently than as was done in other countries. Significant differences were reported with SLPs from USA/CA: compared to the SLPs from the UK and AUS/NZ, a greater number from USA/CA reported assessing problem solving (χ^2 (8, n=251) = 33.88, p<.001), written language (χ^2 (8, n=243) = 20.89, p=.007), and reading decoding (χ^2 (8, n=249) = 17.01, p=.03) as part of routine clinical practice. The setting of care did not influence the areas of communication assessed, but there were significant differences when it came to individual SLPs' years of experience. A higher percentage of SLPs with more years of experience reported assessing pragmatic skills (χ^2 (4, n=286) = 25.28, p<.001), discourse (χ^2 (4, n=277) = 25.28, p=.02), high-level language (χ^2 (4, n=287) = 11.99, p=.01), problem solving (χ^2 (4, n=253) = 29.56, p<.001), word-finding (χ^2 (4, n=288) = 10.58, p=.03), written language (χ^2 (4, n=286) = 17.17, p=.002), reading (decoding) (χ^2 (4, n=288) = 10.58, p=.003), reading comprehension (χ^2 (4, n=286) = 13.42, p=.009), and receptive language (χ^2 (4, n=288) = 10.26, p=.04) as part of routine clinical practice compared with SLPs with fewer years of experience.

4.3   Assessment tools used in clinical practice

Overall, cognitive communication/high-level language and aphasia assessments were the two most frequently used categories of assessment tools by SLPs working in adult TBI (see Figure 4.2). Cognitive neuropsychology assessments comprised about 10% of those conducted by SLPs. They were used more than discourse and pragmatic skill assessment tools.
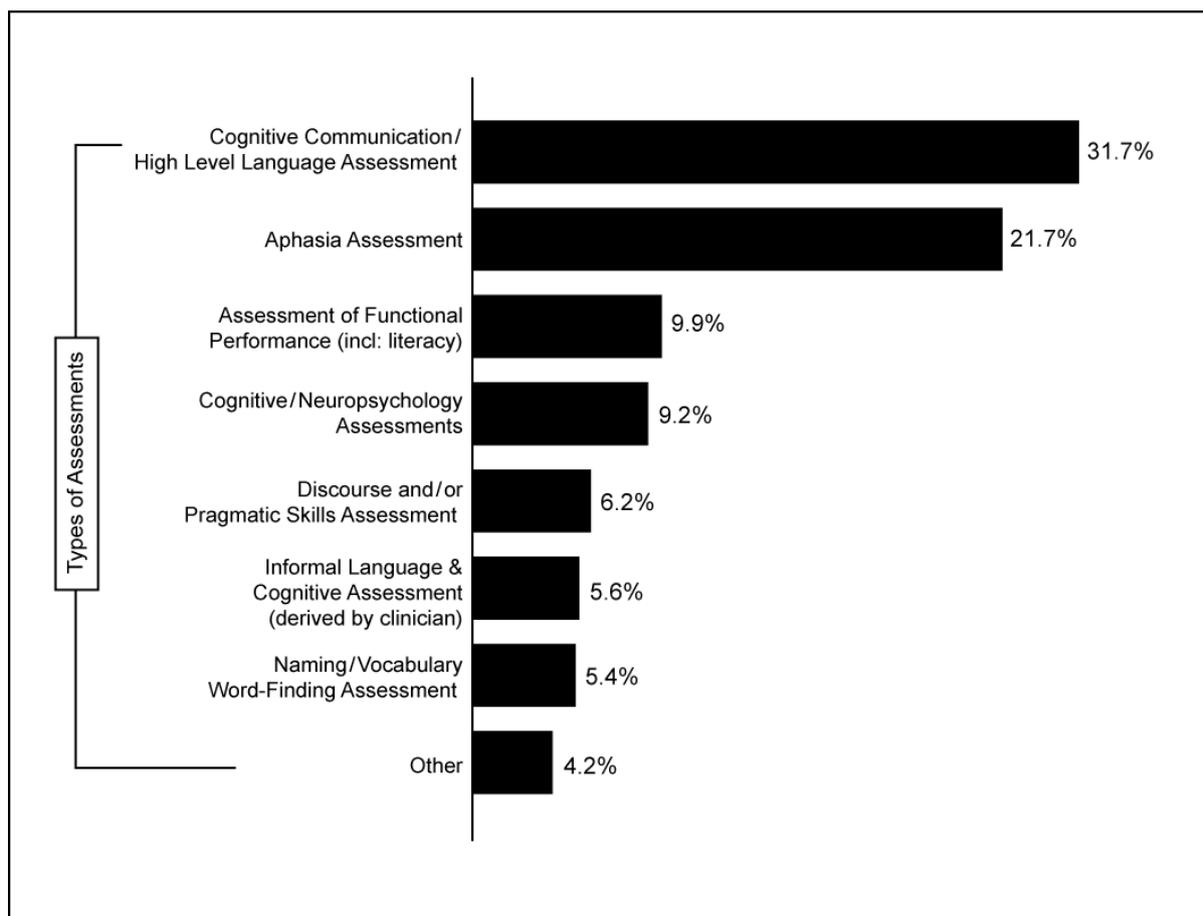
Figure 4.2 Assessment tools by category assessed by SLPs working in adult TBI.

The most commonly used assessment tools within the categories included the

Boston Diagnostic Aphasia Examination (BDAE; Goodglass & Kaplan, 2000) and the

Western Aphasia Battery (WAB; Kertesz, 2006) for aphasia assessments, which

comprised approximately 40% of assessment tools, followed by a large number of

other aphasia assessments. In the cognitive communication and high-level language

category, two assessments were prominent, including the Mount Wilga High Level

Language assessment (MWHLL; Christie et al., 1986) and Measure of Cognitive

Linguistic Ability (MCLA; Ellmo, Graser, Krchnavek, Hauk, & Calabrese, 1995).

These two combined comprised 70% of the category. The Functional Assessment of

Verbal Reasoning and Executive Strategies (FAVRES; MacDonald, 2003) was the

most popular tool in the assessment of functional performance category, followed by

a number of reading tests. The Ross Information Processing Assessment 2nd Edition

(RIPA 2; Ross-Swain, 1996) was the most popular tool in the

cognitive/neuropsychology category with 30% usage, followed by a variety of

different cognitive assessments measuring a variety of factors such as intelligence,

memory, and attention. With 66.7% of SLPs using The Boston Naming Test (BNT;

Kaplan et al., 2001), it was the most frequently used assessment in the naming

and/or word finding category, and the La Trobe Communication Questionnaire (LCQ;

Douglas, Bracy, & Snow, 2000) was the most popular tool in the

discourse/pragmatic skills category with 35%. The informal assessment category

comprised observation and clinician-derived assessments; various outcome

measures and paediatric language assessments comprised the other category.

4.5   Factors influencing choice of assessment tools

There was a significant difference in the use of assessment tools for the

different countries involved in the research (χ^2 (14, n=779) = 97.31, p<.001). As

shown in Table 4.1, SLPs who worked in adult TBI from AUS/NZ used more

cognitive communication and high-level language assessments compared with SLPs

from USA/CA who used them significantly less. SLPs from USA/CA also used a

larger number of functional and informal assessments, whereas SLPs from AUS/NZ

more often used discourse assessments. There was no difference in the use of

aphasia assessments by SLPs across the three country groups.

Table 4.1 Assessment categories used by SLPs in each country

Assessment Tool	Average %	Country (% of Use)		
		AUS / NZ	UK	USA/CA
Aphasia assessment	27.7	25.9	32.7	25.9
Cognitive communication/ high-level language	31.7	39.9*	33.2	23.6*
Cognitive/ neuropsychology assessments	9.2	0.8*	6.6	18.4*
Assessment of functional performance (incl: literacy)	9.9	8.0	6.6	13.8*
Informal language/cognitive assessment	5.6	9.5*	2.4*	4.6
Naming & / or word finding assessment	5.4	3.0*	6.2	6.9
Discourse &/ or pragmatic skills assessment	6.2	9.1*	6.2	3.6*
Other assessment	4.2	3.8	6.2	3.3

*indicates p<.001

Each country had a different preference for assessment tools. These preferences were then categorised, as shown in Table 4.2. There were similarities in the preference of assessment tools, with the MHWLL (Christie et al., 1986) and MCLA (Ellmo et al., 1995) and the Psycholinguistic Assessment of Language Processing in Adult Acquired Aphasia being most popular in UK and AUS/NZ (PALPA; Kay et al., 1992). Some differences in the results were the use of the Comprehensive Aphasia Test (CAT; Howard, Swinburn, & Porter, 2004), another aphasia assessment which was among the most popular tools only in the UK, and the BDAE and WAB, which followed by the Scales of Cognitive Ability for Traumatic Brain Injury (SCATBI; Adamovich & Henderson, 1992), were most popular in USA/CA. Although informal assessments failed to reach the top four most preferred tools for the UK, they were the third and fourth most popular with clinicians from USA/CA and AUS/NZ respectively.

Table 4.2 Most popular assessment tools in each country

	Popular tool overall	Most popular tool in order of frequency for each country		
		AUS/NZ	UK	USA/CA
1	MWHLL	MWHLL	MCLA	BDAE/WAB
2	MCLA	MCLA	CAT	SCATBI
3	BDAE	PALPA	MWHLL	CLQT / Informal
4	WAB	Informal	PALPA	RIPA

There was also a significant difference between inpatient and community settings. Discourse and/or pragmatic skills assessments were more likely to be used in a community setting (9.3%) compared to an inpatient setting (3.1%) χ^2 (14, n= 779) = 18.60, p=.01. However, there was no significant difference in assessment tools used between SLPs irrespective of their years of experience, but there was a trend that experienced clinicians (>10years) were more likely to complete a cognitive/neuropsychology and discourse/pragmatic skills assessment.

4.6   Summary

SLPs who worked in adult TBI routinely assessed functional communication as part of clinical practice. SLPs with more years of experience assessed areas such as pragmatic skills, discourse, high-level language, and problem solving as part of routine clinical practice. Assessment tools predominately used included aphasia and cognitive communication or high-level language assessments, and cognitive assessments and assessments of functional performance also comprised assessment tools used in clinical practice albeit not as frequently. Discourse and pragmatic skills assessments were more likely to be used in a community setting. Chapter 5 will now describe the assessment practice of SLPs working in paediatric DLI.

Chapter 5 - Results

Assessment Practices of SLPs Working in Paediatric DLI

5.1   Areas of communication assessed in clinical practice

Receptive and expressive language skills, followed by receptive vocabulary, were reported by SLPs working in paediatric Developmental Language Impairment (DLI) the most routinely assessed areas of communication. The responses from SLPs in all other areas of communication, including functional communication, revealed variability in clinical practice. Except for phonemic awareness, areas of literacy were the areas of communication least likely to be assessed in clinical practice (see Figure 6.1).
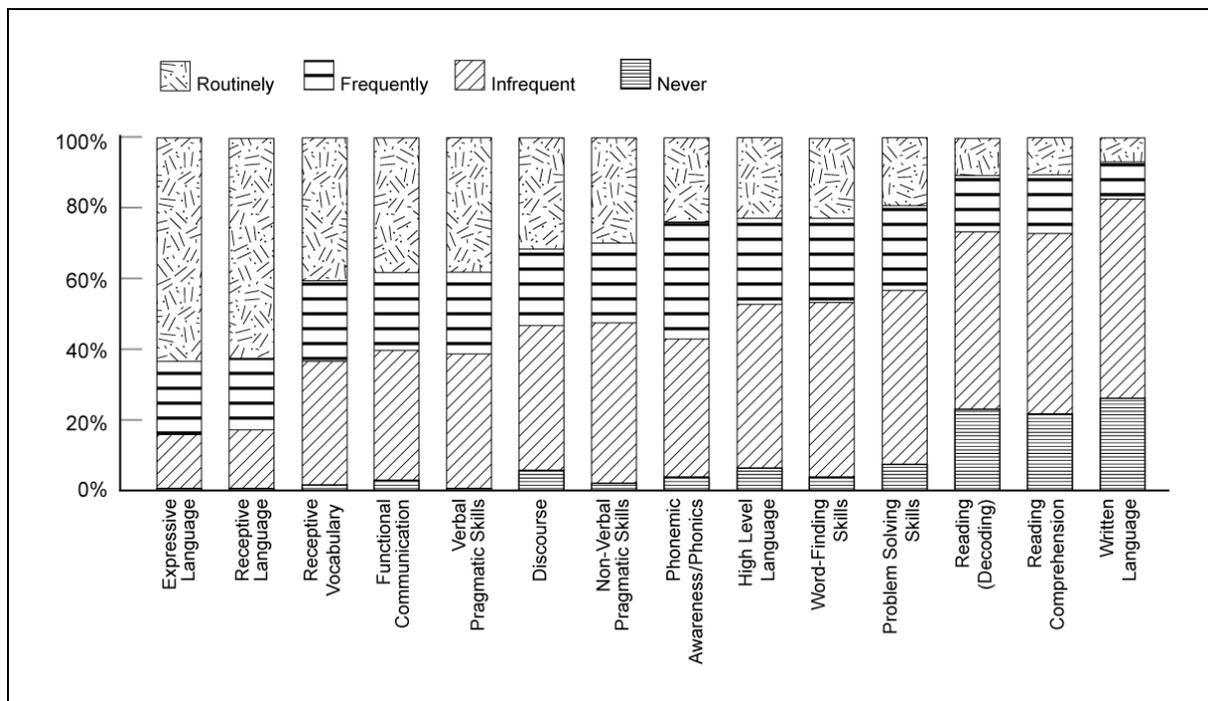
Figure 5.1 Areas of communication assessed in paediatric DLI in order or frequency

5.2   Factors influencing areas of communication assessed in clinical practice

There were significant differences between the reported frequencies of various areas of communication as assessed by SLPs working in paediatric DLI from the countries studied. Higher numbers of SLPs from USA/CA reported assessing discourse (χ^2 (9, n=392) = 16.74, p=.05), receptive vocabulary (χ^2 (9, n=402) = 20.034, p=.02), and problem solving, (χ^2 (9, n=399) = 17.36, p=.04) routinely in clinical practice when compared with SLPs from AUS/NZ and UK. On the other hand, phonemic awareness was routinely assessed by more SLPs from AUS/NZ than USA/CA and UK (χ^2 (9, n=401) = 20.1, p=.02). In addition, there were significant differences between SLPs with differing levels of experience. For example, less experienced SLPs reported assessing phonemic awareness skills more often than SLPs with more years of experience (χ^2 (3, n=401) = 9.56, p=.02), and more experienced SLPs in turn reported assessing high-level language more often (χ^2 (3, n=398) = 11.96, p=.008).

5.3   Assessment tools used in clinical practice

The CELF-4 (Semel et al., 2003) was the most popular assessment tool used by SLPs working in paediatric DLI, with 87.6% of them using it in clinical practice. After this, there was then a significant drop to less than half of sampled SLPs using other assessments in clinical practice (see Figure 5.1). The most popular assessment tools used by SLPs as reported by the open-ended text boxes included informal assessments, consisting of observation and the OWLS (Carrow-Woolfolk, 1995).

Table 5.1 Most popular used assessments by SLPs working in paediatric DLI

Ranking	Assessment	# of SLPs	Percentage (%) of Respondents
1	Clinical Evaluations of Language Fundamentals Fourth Edition (CELF-4)	346	87.6
2	Peabody Picture Vocabulary Test (PPVT)	189	47.8
3	Test of Problem Solving Elementary (TOPS)	187	47.3
4	Renfrew Action Picture Test (RAPT)	174	44.1
5	Comprehensive Assessment of Spoken Language (CASL)	168	42.5
6	Renfrew Bus Story (RBS)	146	40
7	Test for Auditory Comprehension of Language (TACL)	139	35.2
8	Test of Written Language (TOWL)	115	29.1
9	School Age Oral Language Assessment (SAOLA)	105	26.6
10	Neale Analysis of Reading Ability (NEALE)	104	26.3
11	Children's Communication Checklist 2nd Ed (CCC2)	101	25.6
12	Test of Language Competence Expanded Edition (TLC 1/2)	98	24.8
13	Expression, Reception Recall Narrative Instrument (ERRNI)	85	21.5
14	100 Picture Word Naming Assessment (HPNT)	79	20
15	Weschler Individual Achievement Test (Oral Expression Subtest) OE/WIAT	71	18
16	Informal Assessments	48	17.7
17	Oral & Written Language Scales (OWLS)	47	17.3
18	Sutherland Phonological Awareness Test (SPAT)	28	10.3
19	Expressive One Word Picture Vocabulary Test (EOWPVT)	26	9.6
20	Test of Language Development (TOLD)	24	8.9
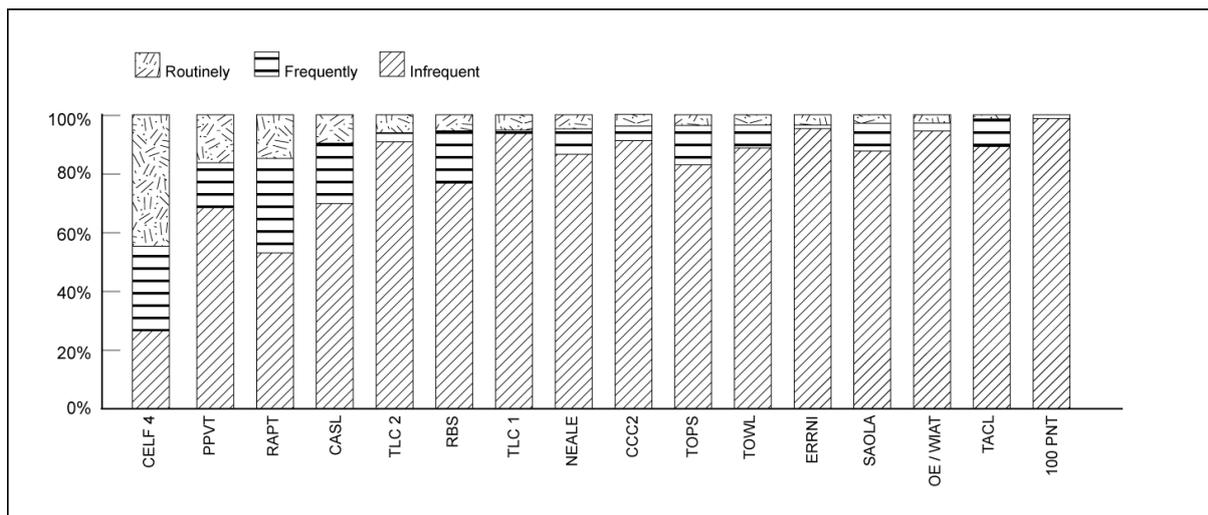
Figure 5.2 Assessments used by SLPs in paediatric DLI in order of frequency

SLPs then rated how frequently they used each assessment tool in clinical practice, as shown in Figure 5.2. The CELF-4 (Semel et al., 2003) was used most frequently in clinical practice; conversely the majority of other assessment tools were reportedly used infrequently. In contrast, the TOPS (Huisingh et al., 2005) was the third most popular assessment tool among SLPs, but when compared to other assessment tools, it was used less frequently.

5.4   Ratings of satisfaction for assessment tools by SLPs for strengths and weaknesses/goal setting and intervention planning

Overall, SLPs working in paediatric DLI presented with similar satisfaction levels for the assessment's ability both to identify strengths and weaknesses in a child's communication skills (see Figure 5.3) and to assist with goal setting and intervention planning (see Figure 5.4). The CELF-4 (Semel et al., 2003) was the assessment with the highest level of satisfaction for the two areas of criteria.
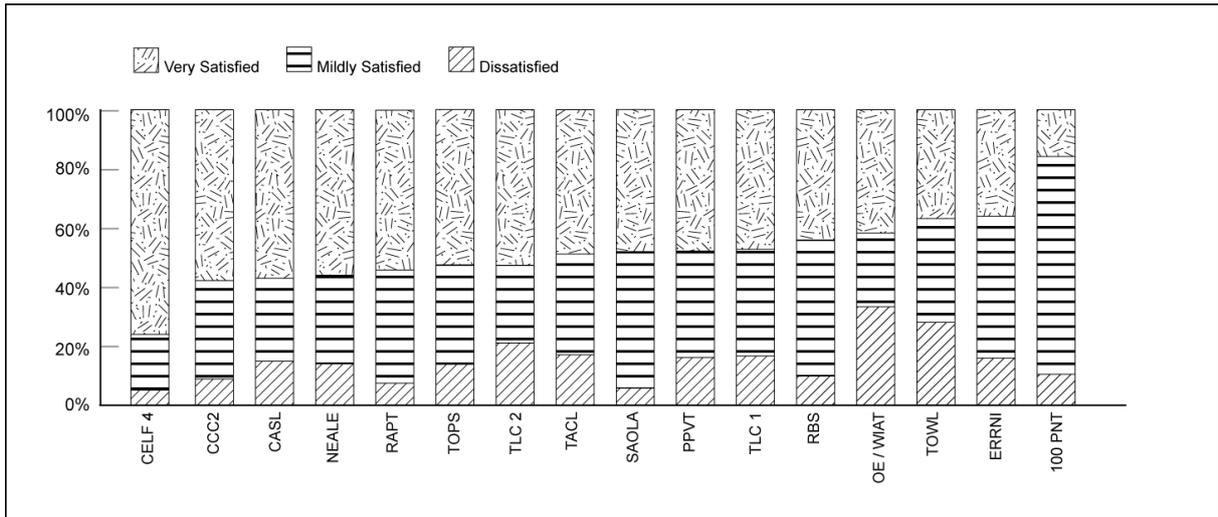
Figure 5.3 SLP's satisfaction of assessment tools for identifying strengths and weaknesses in communication skills
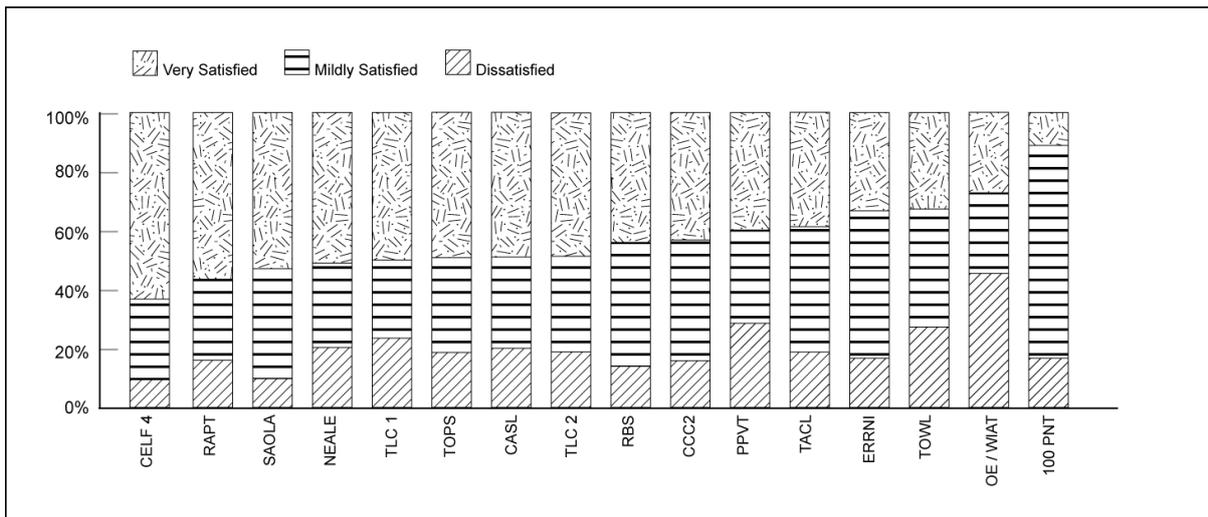
Figure 5.4 SLP's satisfaction of assessment tools for assisting with goal setting and intervention planning

There were a number of assessment tools that had high satisfaction ratings for identifying strengths and weaknesses. These included the CCC-2 (Bishop, 2003a), CASL (Carrow-Woolfolk, 1999), NEALE (Neale, 1997), and RAPT (Renfrew, 2003). These tools were also rated as having high satisfaction levels for goal setting and intervention planning; however, the CCC2 was rated considerably lower in the

list of choices. The ERRNI (Bishop, 2004), TOWL (Hammill & Larson, 1996), HPNT (Fisher & Glenister, 1992), and WIAT (Wechsler, 2005) were rated as having the lowest levels of satisfaction for both criteria.

5.5   Factors influencing assessment tools in clinical practice

Each country had particular preferences for different assessment tools amongst SLPs working in paediatric DLI. There were significant differences with the frequency of which assessments were conducted in clinical practice. SLPs from AUS/NZ routinely used the CELF-4 (Semel et al., 2003), SAOLA (Leitão & Allan, 2003), and NEALE (Neale, 1997) in clinical practice more often, while the PPVT (Dunn & Dunn, 1981) and CASL were used routinely in USA/CA. In the UK, the RAPT (Renfrew, 2003) was used routinely compared to USA/CA and AUS/NZ (see Table 5.2). The most popular assessment tools per country, which are outlined in Table 5.3, reveal similarities between countries with the CELF-4 (Semel et al., 2003), RAPT (Renfrew, 2003), and RBS (Renfrew, 1991). There were some notable differences, however. The UK reported the CCC-2 and an assessment repeatedly noted in the open-ended text boxes, the Assessment of Comprehension and Expression (ACE; Adams, Coke, Crutchley, Hesketh, & Reeves, 2001), whereas the TACL-3 (Carrow-Woolfolk, 1998) was reported in USA/CA. Overall, the results of the study highlighted that SLPs from AUS/NZ possibly used the CELF-4 (Semel et al., 2003) in isolation, whereas SLPs from USA/CA used a mixture of assessments, and SLPs from the UK favoured the CELF-4 (Semel et al., 2003) and RAPT (Renfrew, 2003) for routine use in clinical practice. Irrespective of how much clinical experience an SLP had, there were no differences in the assessment tools they used.

Table 5.2 Significant differences between assessment tools frequency of use by SLPs from different countries.

Assessment	Average (%)	% of SLPs who routinely use assessment tool from each country			p value
		AUS/NZ	UK	USA/CA	
CELF-4	45.2%	58.0%	39.4%	37.9%	$\chi2$ (4, n=334) = 16.51, p=.002
PPVT	16.5%	6.5%	0.0%	20.6%	$\chi2$ (4, n=188) = 11.97, p=.018
CASL	20.2%	2.6%	16.7%	26.1%	$\chi2$ (4, n=163) = 16.12, p=.003
RAPT	15.1%	16.2%	29.0%	2.4%	$\chi2$ (4, n=172) = 27.33, p<.001
NEALE	8.8%	15.5%	0.0%	0.0%	$\chi2$ (4, n=102) = 12.31, p=.015
SAOLA	9.6%	15.6	0.0%	0.0%	$\chi2$ (4, n=104) = 9.27, p=.05

Table 5.3 Most popular assessment tools in each country

	Popular tool overall	Most popular tool in order of frequency for each country		
		AUS/NZ	UK	USA/ CA
1	CELF-4	CELF-4	CELF-4	CELF-4
2	PPVT	RAPT	RAPT	PPVT
3	TOPS	RBS	RBS	CASL
4	RAPT	TOPS	CCC2	TOPS
5	CASL	SAOLA	ACE	TACL-3

5.6 Assessment choices for SLPs working in DLI when assessing a child with a TBI

SLPs working in paediatric DLI were asked to propose which assessment tools they may use if they were asked to assess a school-aged child with a TBI. Slightly more than half of SLPs reporting having no experience assessing a child's communication skills after a TBI (56.2%, n=173). Over half of the SLPs (51.1%) stated that their assessment of the communication skills of a child after a TBI would be different from assessing those of a child with a developmental language impairment, 14.9% stated that there would be no change, and 34% were unsure.

SLPs were then asked to report on what they would use in clinical practice. As shown in Figure 5.5, over half of the SLPs would routinely use a questionnaire for the parent to complete, but in this regard, the CELF-4 (Semel et al., 2003) would not be reported used as frequently as would an informal discourse assessment or high-level language assessment. Formal discourse and literacy assessments did not necessarily make up routine clinical practice; there was a variety of other standardised assessment tools recommended, of which no assessment tool was most prominent. The top six assessment tools are outlined in Table 5.4. Interestingly, half of the tools were one-word picture vocabulary tests, and except for the ROWPVT (Brownell, 2010), the assessment tools used did not differ from the 20 highest-ranking assessment tools used by SLPs working in paediatric DLI.
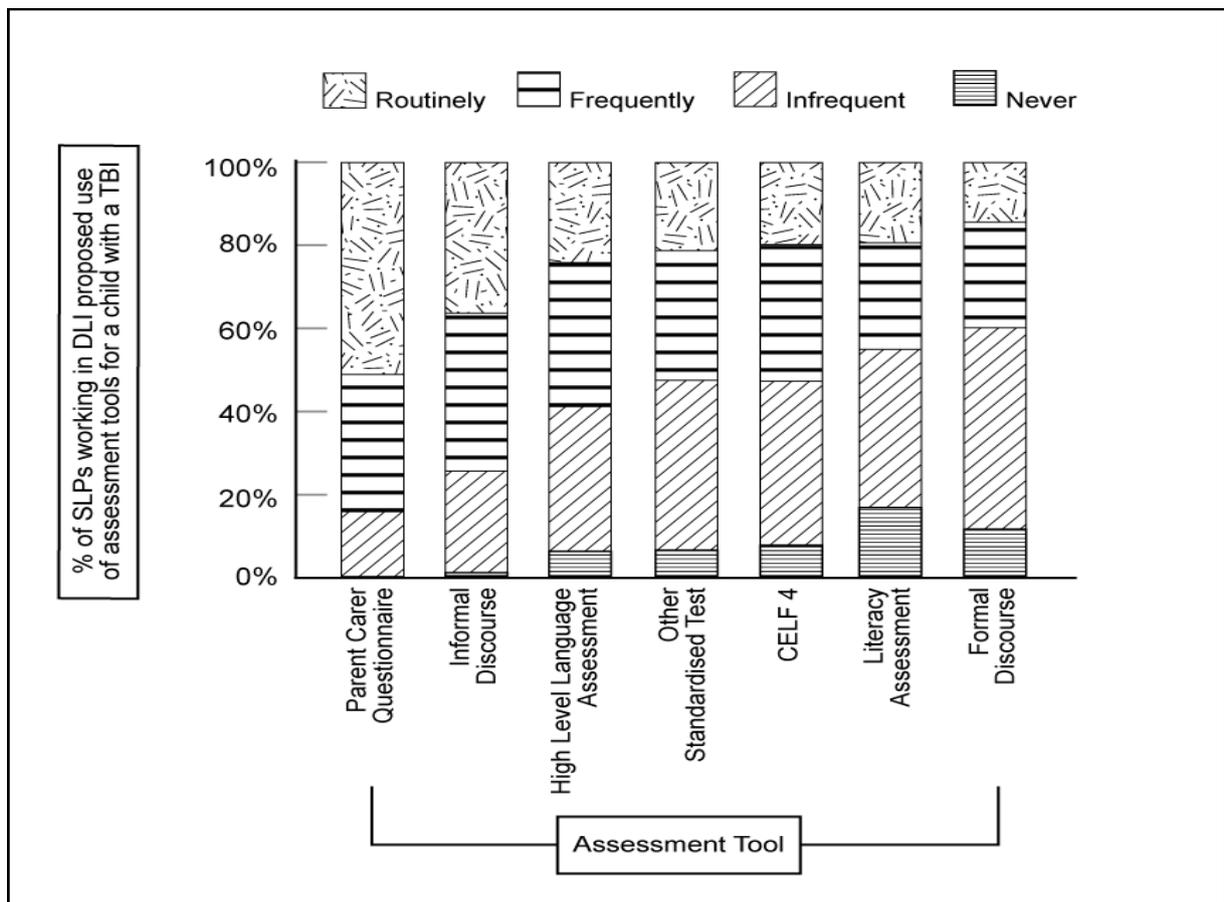
Figure 5.5 Assessment tools used by SLPs working in DLI when assessing a child with a TBI

Table 5.4 Most popular standardised assessment tools SLPs suggested they would use working in DLI for a child with a TBI.

Ranking	Assessment	# of SLPs
1	Test of Problem Solving Elementary (TOPS)	11
2	Expressive One Word Picture Vocabulary Test (EOWPVT)	8
3	Comprehensive Assessment of Spoken Language (CASL)	7
4	Oral & Written Language Scales (OWLS)	7
5	Receptive One Word Picture Vocabulary Test (ROWPVT)	6
6	Peabody Picture Vocabulary Test (PPVT)	5

There were some significant differences in the frequency of use of the different assessment tools used by SLPs based on whether they had prior experience assessing a child with a TBI or not. That is, SLPs with experience in TBI were less likely to conduct either an informal discourse assessment (χ^2 (3, n=286) = 8.18, p=.04) or a high-level language assessment (χ^2 (4, n=277) = 11.43, p=.01).

5.7   Summary

As part of clinical practice, SLPs working in paediatric DLI routinely assessed receptive and expressive language skills followed by receptive vocabulary. There was one main assessment tool used frequently in clinical practice, the CELF-4 (Semel et al., 2003). In contrast, the majority of the other tools were used infrequently. SLPs were highly satisfied with the ability of the CELF-4 to identify strengths and weaknesses in the child's communication skills as well as assist with goal setting and intervention. Other recommended assessments included CCC-2 (Bishop, 2003a) for its ability to describe the child's communication skills as well as the RAPT (Renfrew, 2003) and SAOLA (Leitão & Allan, 2003), which were rated highly for their ability to assist with goal setting and intervention planning. However, the ERRNI (Bishop, 2004), TOWL (Hammill & Larson, 1996), WIAT (Wechsler,

2005), and HPNT (Fisher & Glenister, 1992) were not rated as highly. Overall, the most frequently used assessments in clinical practice were developmental language, followed by a smaller percentage of SLPs using high-level language assessments, vocabulary assessment, and discourse/pragmatic skills assessments (see Figure 5.6).

When asked to review their practices of assessing a child with a TBI, SLPs rated using other standardised tests in addition to the CELF-4. There was a variety of assessments suggested, mainly high-level language assessments and single-word vocabulary tools. Interestingly, SLPs with fewer years of experience were more likely to conduct a discourse assessment as well as a high-level language assessment. Chapter six will now describe the assessment practices of SLPs working in paediatric TBI followed by a comparison of practices among all three clinical groups.
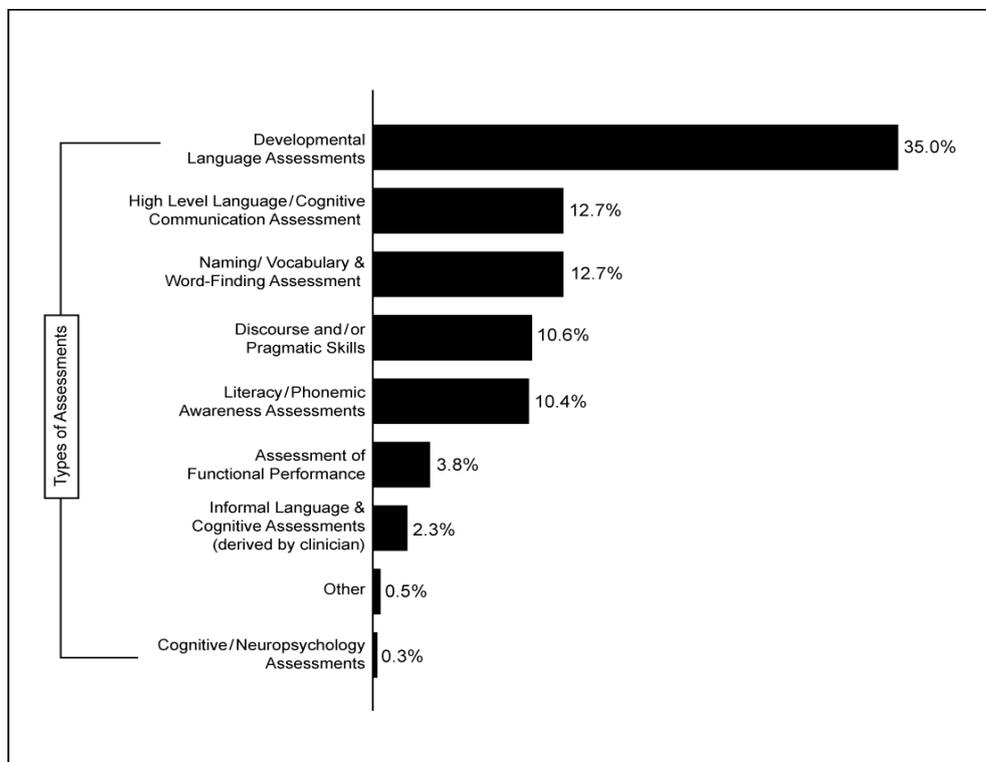
Figure 5.6 Assessment tools by category used by SLPs working in paediatric DLI.

Chapter 6 - Results

Assessment Practices of SLPs Working In Paediatric TBI

6.1   Areas of communication assessed in clinical practice

For SLPs working in paediatric Traumatic Brain Injury (TBI), receptive and expressive language were the areas of communication routinely assessed and were followed by functional communication. However, over 40% of SLPs did not assess functional communication routinely in clinical practice. There was variability between SLPs in terms of the frequency of how different aspects of communication were assessed in clinical practice. Discourse and areas of literacy were the areas of communication that were routinely assessed the least within the sample of SLPs (see Figure 6.1).
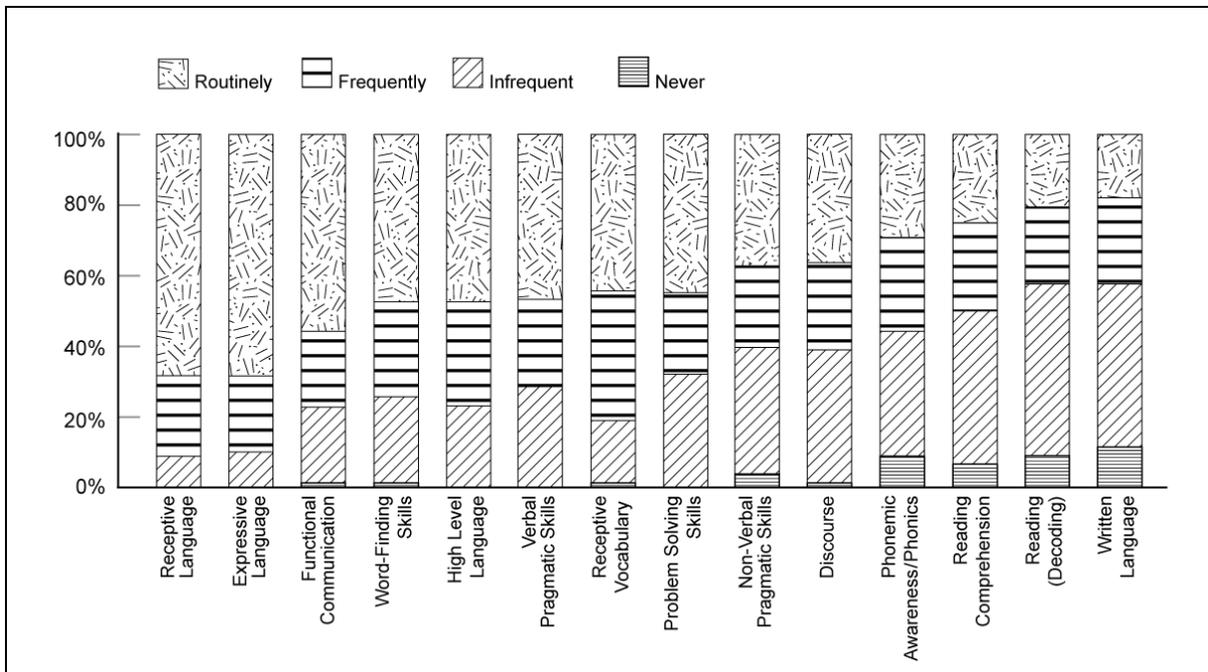
Figure 6.1 Areas of communication assessed in paediatric TBI in order of frequency

6.2   Factors influencing areas of communication assessed in clinical practice

Although the years of experience an SLP had did not impact the frequency or types of areas of communication assessed in clinical practice, there were differences in these areas among SLPs working in paediatric TBI from different countries. A higher percentage of SLPs from USA/CA reported routinely assessing discourse when compared with those from AUS/NZ and UK (χ^2 (9, n=77) = 17.85, p=.04), and functional communication skills were reported to be assessed routinely by a higher percentage of SLPs from the UK when compared with USA/CA and AUS/NZ (χ^2 (9, n=79) = 20.03, p=.018). While there were no significant differences among inpatient and community setting, there was a trend to significance with word-finding skills being assessed more often in an inpatient setting than a community setting (χ^2 (3, n=78) = 6.83, p=.08).

6.3   Assessment tools used in clinical practice

As shown in Table 6.1, the CELF-4 (Semel et al., 2003) was the most popular standardised assessment tool by SLPs working in paediatric TBI: over 90% of respondents reported using the test in clinical practice. There was then a drop in popularity of assessment tools with only five other assessments reported being used by over 50% of the sample of SLPs. In the open text box responses, informal assessments, which included observation and clinician-derived tests of literacy, were revealed as the most popular

Table 6.1 Most popular assessments used by SLPs working in paediatric TBI

Ranking	Assessment	# of SLPs	Percentage (%) of Respondents
1	Clinical Evaluations of Language Fundamentals Fourth Edition (CELF-4)	71	93.4
2	Renfrew Action Picture Test (RAPT)	50	65.8
3	Peabody Picture Vocabulary Test (PPVT)	49	64.5
4	Test of Problem Solving (TOPS)	47	61.8
5	Renfrew Bus Story (RBS)	40	52.6
6	Test of Language Competence (TLC)	39	51.3
7	Comprehensive Assessment of Spoken Language (CASL)	36	47.4
8	Neale Analysis of Reading Ability (NEALE)	34	44.7
9	Expression, Reception Recall Narrative Instrument (ERRNI)	34	44.7
10	Test for Auditory Comprehension of Language (TACL)	33	43.4
11	Test of Written Language (TOWL)	31	40.8
12	100 Picture Word Naming Assessment	31	40.8
13	School Age Oral Language Assessment (SAOLA)	29	38.2
14	Children's Communication Checklist	24	31.6
15	Weschler Wide Achievement Test (Oral Expression Subtest)	21	27.6
16	Informal Assessments	14	27.4
17	Paediatric Test of Brain Injury (PTBI)	6	11.8
18	Oral & Written Language Scales (OWLS)	6	11.8
19	Test of Word-Finding in Discourse	6	11.8
20	Woodcock Language Proficiency Battery-Revised (WLPB-R)	5	9.8
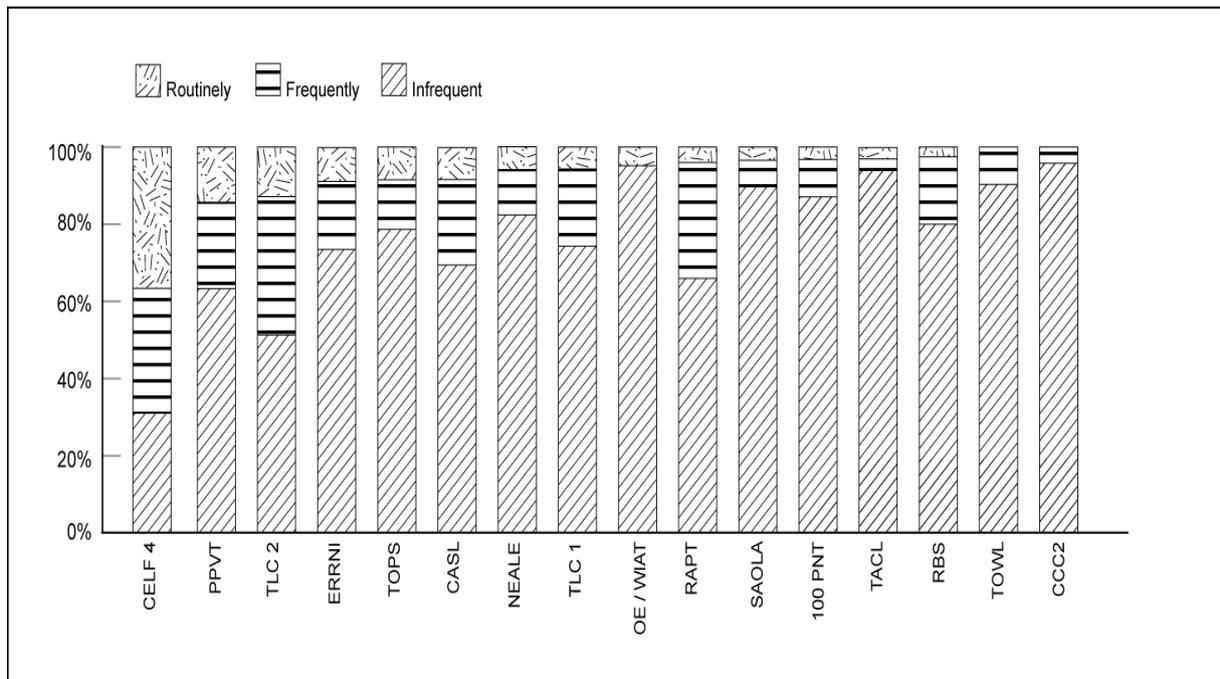
Figure 6.3 Assessments used by SLPs in paediatric TBI in order of frequency

SLPs then rated how frequently they used each assessment in clinical practice, which is shown in Figure 6.2. The CELF-4 (Semel et al., 2003) was used the most frequently in clinical practice, whereas the majority of assessment tools used were reported to be used infrequently. Of note, assessments such as the RAPT (Renfrew, 2003) and RBS (Renfrew, 1991) were used infrequently even though they were reported as some of the most popular tools used in paediatric TBI.

6.4 Ratings of satisfaction for assessment tools by SLPs for strengths and weakness, goal setting, and intervention planning

Overall, SLPs working in paediatric TBI were more satisfied with the ability of all assessments that they could rate in the survey in identifying strengths and weaknesses in a child's communication skills (see Figure 6.4) and less so in their ability to assist with goal setting and intervention planning (see Figure 6.5). SLPs were satisfied with the CELF-4 (Semel et al., 2003) and ERRNI (Bishop, 2004) for their

ability to identify strengths and weaknesses as well as their ability to assist with goal setting and intervention. The NEALE (Neale, 1997) was rated highly for identifying strengths and weaknesses but less so for goal setting and intervention. SLPs reported using the CCC-2 (Bishop, 2003a) infrequently although they rated it with high satisfaction for its ability to identify strengths and weaknesses in communication skills; however, there was variability in satisfaction among SLPs in its ability to assist with goal setting and intervention. Few assessments had high ratings of dissatisfaction, yet assessments that SLPs rated as dissatisfactory for identifying strengths and weaknesses included the TLC 1 and 2 (Wiig & Secord, 1989). Assessments rated as dissatisfactory for goal setting and intervention planning also included the TLC 2 (Wiig & Secord, 1989), CCC-2 (Bishop, 2003a), PPVT (Dunn & Dunn, 1981), and TOPS (Huisingh et al., 2005). The HPNT (Fisher & Glenister, 1992) had the highest level of dissatisfaction.
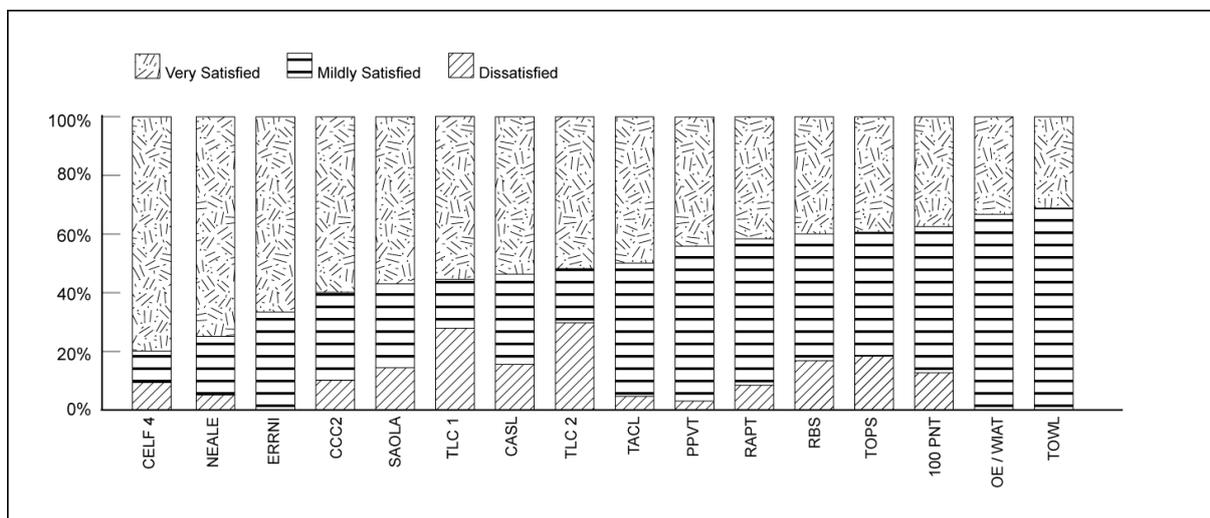
Figure 6.4 SLPs' satisfaction of assessment tools for identifying strengths and weaknesses in communication skills
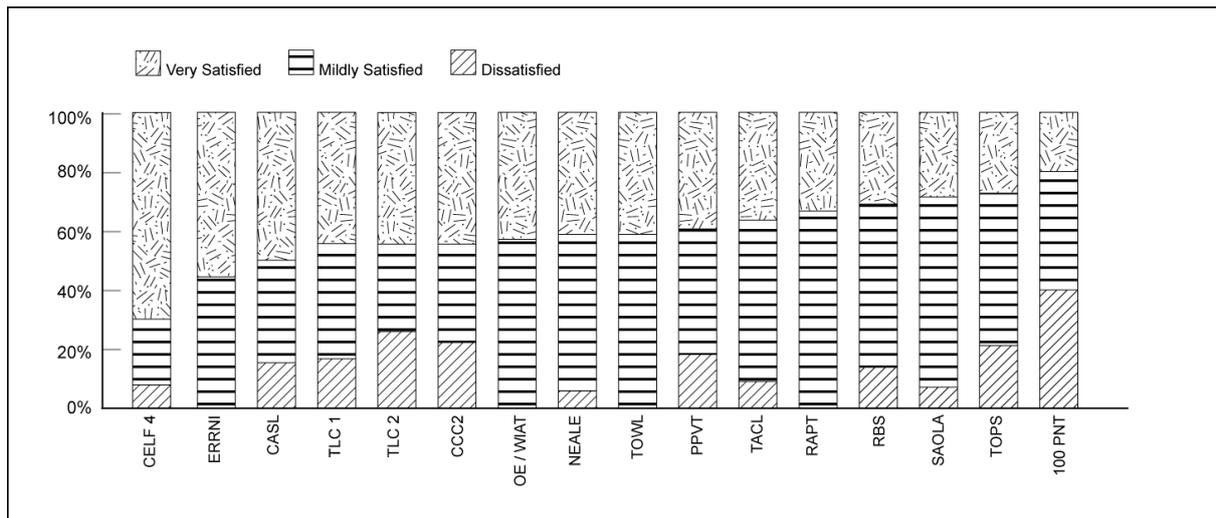
Figure 6.5 SLPs' satisfaction of assessment tools for assisting with goal setting and intervention planning

6.5   Factors influencing assessment tools used in clinical practice

There were no significant differences between assessment tools used by SLPs working in paediatric TBI in either an inpatient or community setting, but there was a trend to significance with the use of the RAPT (Renfrew, 2003) in an inpatient setting (χ^2 (2, n=50) = 5.63, p=.06). There was one significant difference in the satisfaction of the assessments: the TOPS (Huisingh et al., 2005) rated more highly in an inpatient setting than it did in a community setting owing to its ability to assist with goal setting and intervention planning (χ^2 (2, n=33) = 10.61, p=.005). There was no difference in the use of assessment tools amongst SLPs from different countries, but there was a significant difference in the use of the ERRNI (Bishop, 2004) by SLPs with fewer than 10 years' experience over SLPs with more years of experience (χ^2 (2, n=34) = 11.79, p=.003). The most popular tools for each country are highlighted in Table 6.2, with SLPs from AUS/NZ and USA/CA having a literacy assessment in the top five and SLPs from the UK having two discourse assessments in their top five.

Table 6.2 Most popular assessment tools in each country

Popular tool overall		Most popular tool in order of frequency for each country		
		AUS/NZ	UK	USA/ CA
1	CELF-4	CELF-4	CELF-4	CELF-4
2	RAPT	RAPT	RAPT	PPVT
3	PPVT	PPVT	RBS	CASL
4	TOPS	TOPS	ERRNI	TOPS
5	RBS	RBS/NEALE	TLC-E	TOWL

6.6   Summary

SLPs working in paediatric TBI routinely assess receptive and expressive language, with variability in frequency for functional communication, word finding, high-level language and pragmatic skills. Discourse and literacy were the least frequent areas of communication assessed for the school-aged child. There were differences amongst SLPs from the different countries, with SLPs from USA/CA reporting problem solving and discourse to be assessed more frequently compared with the other SLPs. The CELF-4 (Semel et al., 2003) was the most popular assessment tool; it was used by over 90% of colleagues and was frequently used in clinical practice. Other assessment tools, however, were used infrequently as part of clinical practice. SLPs were highly satisfied that CELF-4, which was popular across the major English-speaking countries, had the ability to identify strengths and weaknesses in a child's communication skills as well as assist in goal setting and intervention planning.

There were similarities in other tools used by SLPs from the different countries. For example, the RAPT (Renfrew, 2003), RBS (Renfrew, 1991), and TOPS (Huisingh et al., 2005) were used in most of the countries. Results suggested that the RAPT (Renfrew, 2003) was a popular tool to use in the inpatient setting and

that the TOPS (Huisingh et al., 2005) was useful for goal setting and intervention planning in an inpatient setting even though it was one of the assessments with the lowest satisfaction ratings overall. Although the CELF-4 was rated equally across both criteria, a lot of the assessment tools were not, which indicates that some of the available tools were better for identifying issues within communication whereas others were better for goal setting and intervention planning. The ERRNI (Bishop, 2004), CCC-2 (Bishop, 2003a), and the CASL (Carrow-Woolfolk, 1999) were the only other assessments that had relative high satisfaction levels across the two criteria.

Overall, developmental language tools, which focused on word and sentence-level tasks, were those most frequently used (see Figure 6.6). Discourse and pragmatic assessment tools comprised less than 20% of the tools used in clinical practice and were also used infrequently in clinical practice. Within this category, frequently used discourse assessments were narrative assessments, such as ERRNI and RBS. Literacy did not comprise a high percentage of the assessments used, and there were few assessments targeting functional performance.
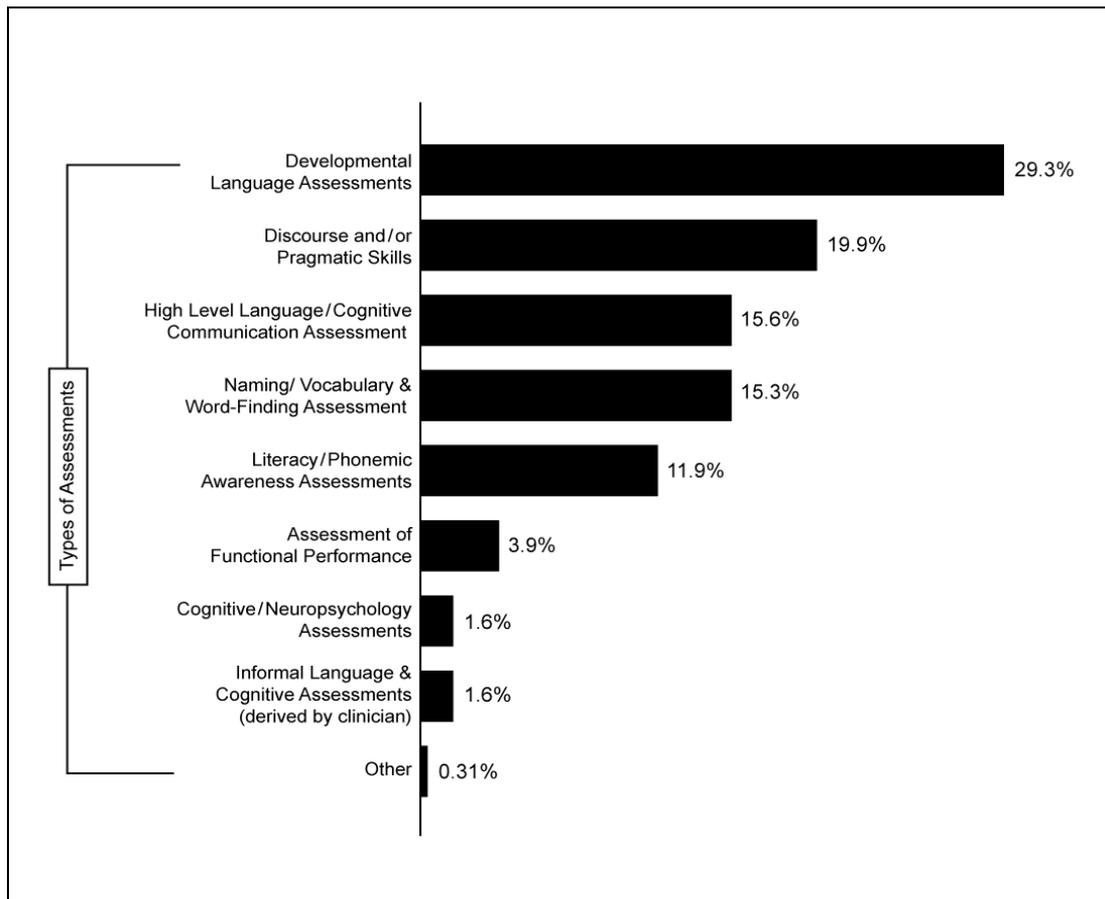
Figure 6.6 Assessment tools by category used by SLPs working in paediatric TBI.

6.7 Areas of communication assessed in clinical practice: Comparison across the three clinical groups.

Areas of communication assessed in clinical practice differed between the three clinical groups. A significantly higher percentage of SLPs working in adult TBI than in paediatric TBI assessed a number of areas of communication routinely, compared to a lower percentage of SLPs in paediatric DLI doing so, as shown in Table 6.3. Results highlighted that receptive vocabulary was an area of communication assessed routinely in paediatric DLI and TBI but not in adult TBI. Pragmatic skills, word finding ability, high-level language, and problem solving were areas routinely assessed in both adult and paediatric TBI but not in paediatric DLI. Discourse, reading (decoding), reading comprehension, written language, and

functional communication were significantly more likely to be assessed in adult TBI

and significantly less likely in paediatric DLI. In paediatric TBI, discourse was not

significantly more or less likely to be assessed, a fact highlighted by the variability in

response by SLPs on the question of how frequently they assessed it within that

area.

Table 6.3 Significant differences between areas of communication routinely assessed by SLPs for the three clinical groups

Area of Communication	Average%	Routine % for each clinical group			p value
		Paed DLI	Paed TBI	Adult TBI	
Pragmatic skills	45.7%	37.6%	48.1%*	58.9%*	(χ^2 (6, n=763) = 49.18, p<.001).
Discourse	36.2%	31.3%	38.0%	44.3%*	(χ^2 (6, n=745) = 31.25, p<.001).
Word finding ability	39.0%	23.0%	48.8%*	62.9%*	(χ^2 (6, n=766) = 148.26, p<.001).
Receptive Vocabulary	37.2%	39.1%*	44.4%*	31.5%	(χ^2 (6, n=752) = 21.28, p=.002).
High-level language	39.0%	23.1%	48.8%*	62.6%*	(χ^2 (6, n=762) = 139.00, p<.001).
Problem Solving	35.0%	19.6%	46.3%*	57.5%*	(χ^2 (6, n=760) = 129.79, p<.001).
Reading (decoding)	19.9%	11.3%*	20.0%	34.8%*	(χ^2 (6, n=748) = 109.10, p<.001).
Reading Comprehension	25.3%	11.2%*	26.9%	48.4%*	(χ^2 (6, n=759) = 178.11, p<.001).
Written Language	19.6%	7.8%*	18.8%	40.0%*	(χ^2 (6, n=754) = 191.45, p<.001).
Functional Communication	53.5%	37.9%*	56.8%	78.8%*	(χ^2 (6, n=764) = 120.33, p<.001).

* indicates which groups were significantly different

6.8 Assessment tools used in Clinical Practice: Comparison across the three clinical groups.

Across all clinical groups, SLPs favoured the use of word and sentence-level

standardised tests irrespective of whether such tests were designed for the aphasia

population or developmental language population. There were similarities amongst

SLPs from the different English-speaking countries in the kinds of tests used. For example, SLPs working in adult TBI mainly used aphasia or cognitive communication/high-level language assessments. There were also both similarities and differences with the specific tools used from each category. As seen in Table 4.2, MHWLL (Christie et al., 1986) and MCLA (Ellmo et al., 1995) were commonly used for cognitive communication and high-level language assessments, yet when it came to aphasia assessments, a wide range was used, including PALPA (Kay et al., 1992), CAT (Howard, Swinburn, & Porter, 2004), WAB (Kertesz, 2006), and BDAE (Goodglass & Kaplan, 2000). However, for SLPs working in DLI and TBI, developmental language assessments were the most prevalent, and one particular tool, the CELF-4 (Semel et al., 2003), was the most frequently used tool across the three country groups. It was rated high in satisfaction for its ability to identify strengths and weaknesses as well as to assist in goal setting and intervention planning. One of the striking differences across the three clinical groups however was the lack of cognitive assessments and assessments of functional performance used by SLPs working in paediatrics compared to those in adult TBI. In addition, a larger percentage of discourse and pragmatic assessments were used in paediatric TBI compared to paediatric DLI and adult TBI, and vocabulary assessments were used more often in paediatrics than adult TBI. Overall, the results highlighted that there was a trend to use basic measures of language at word and sentence level in assessments for adult TBI and paediatric TBI and DLI, and that there was a stronger focus on functional performance among SLPs in adult TBI than among those working in paediatric TBI and DLI.

The results suggest that SLPs working in paediatric TBI and DLI tend to use one particular assessment and place less emphasis on functional performance. The

next chapter of the results will analyse both how the CELF-4 (Semel et al., 2003) is used in clinical practice and the perceived attitude SLPs that have towards the assessment tool in clinical practice.

Chapter 7 - Results

Clinical Evaluation of Language Fundamentals Fourth Edition

(CELF-4); SLPs' Use in Clinical Practice

7.1   Introduction

As previously described, SLPs working in paediatric DLI (Chapter 5) and paediatric TBI (Chapter 6) reported the CELF-4 as the most frequently used assessment in clinical practice. High satisfaction ratings were reported by both groups for the assessment's ability to identify strengths and weaknesses as well as assist with goal setting and intervention planning. This chapter provides an overview of how SLPs working in paediatric DLI and TBI use the CELF-4. It will highlight how frequently SLPs from each clinical group (DLI or TBI) tabulate each index (summary) score or supplementary test on the CELF-4 in clinical practice. Comparisons will be made within each clinical group and between clinical groups. Years of experience and country of workplace for the SLP will also be reviewed as factors influencing choice in clinical practice. This chapter will also report on the SLPs' perceptions about the use of the CELF-4 in clinical practice, the perceived difficulty or complexity of the subtests, and the influence of working memory on each subtest.

7.2   SLP use of CELF-4 index scores & supplementary tests (TBI & DLI)

Core language (CL), receptive language (RL), and expressive language (EL) were the most routinely tabulated summary scores by SLPs in both DLI and TBI. Level 3 and 4 testing from the CELF-4 working memory (WM), phonological awareness (PA), rapid automatic naming (RAN), word association (WA), observational (ORS), and pragmatic profile (PP) were predominately conducted

infrequently. There was variability in the frequency of use between SLPs in DLI and TBI concerning language content (LC), language structure (LS), and language memory (LM) (refer to Figure 6.1). The ORS/PP was the least routinely tabulated tool from the CELF-4 by SLPs working in TBI, whereas for those working in DLI, PA was.

The only notable difference between the way SLPs tabulated index scores and supplementary tests was with the WA supplementary test. SLPs working in TBI were at 27.7% and DLI were at 15.6%; $\chi2$ (3, n= 368) = 8.45, p=.04. This means that SLPs in paediatric TBI were more likely to tabulate this test than those in paediatric DLI. There were no signficant differences between DLI and TBI for any other index score or supplementary test.

7.3   Factors influencing CELF-4 use in clinical pratice

For SLPs working in paediatric DLI, signficant differences were noted across both factors of country of origin and years of experience. Overall, SLPs working in USA/CA reported using all of Level 1-4 index scores and supplementary tests more frequently than SLPs from UK and AUS/NZ (refer to Table 7.1).
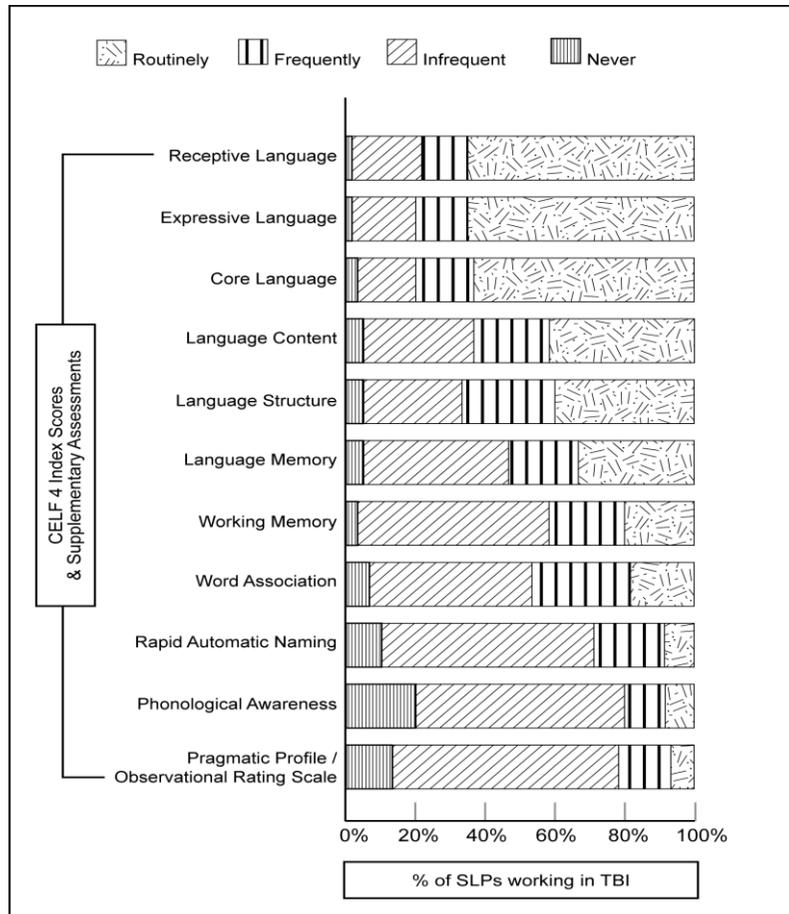
Figure 7.1a Frequency of SLPs working in TBI tabulation of tests from CELF-4
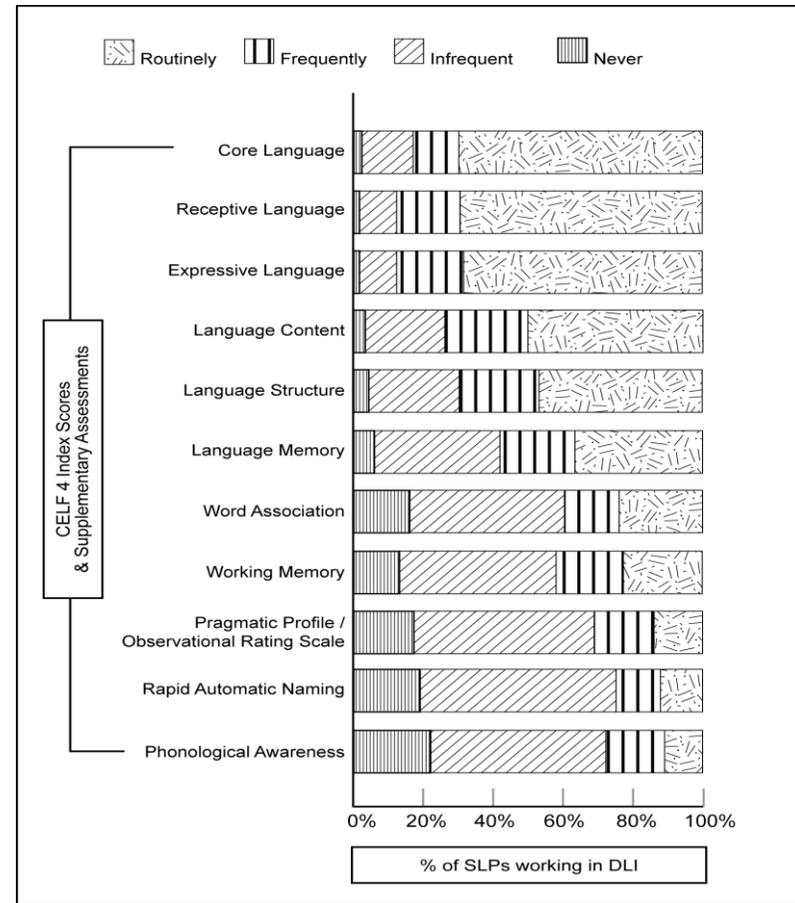
Figure 7.1b Frequency SLPs working in DLI tabulation of tests from CELF-4

Table 7.1 Areas of significance for frequency of SLPs working in DLI tabulation of tests from CELF-4 across country

CELF-4 Index Score	Average (%)	Country of Origin (SLPs DLI)			p Value
		AUS/NZ	UK	USA/CA	
Core Language	69.9%	72.0%	43.3% (-)	73.4%	χ2 (6, n= 306) = 14.48, p= .0.25
Expressive Language	68.4%	70.3%	43.3% (-)	71.7%	χ2 (6, n= 307) = 14.64, p= .0.23
Language Structure	46.8%	37.1% (-)	17.2% (-)	59.6% (+)	χ2 (6, n= 301) = 26.82, p= 0.00
Language Content	50.2%	38.5% (-)	31% (-)	62.4% (+)	χ2 (6, n= 303) = 22.26, p=.001
Language Memory	36.6%	26.7% (-)	25.0%	45.9% (+)	χ2 (6, n= 303) = 14.77, p=.022
Working Memory	22.6%	11.2% (-)	23.3%	30.8% (+)	χ2 (6, n= 305) = 16.87, p=.010
Supplementary Test	Average (%)	Country of Origin (SLPs DLI)			
		AUS/NZ	UK	USA/CA	p Value
Pragmatic Profile	13.9%	6% (-)	6.7%	21.2% (+)	χ2 (6, n= 302) = 27.61, p<.001
Rapid Automatic Naming	12.1%	6.8% (-)	6.7%	17.0% (+)	χ2 (6, n= 306) = 18.87, p=.004
Word Fluency	23.9%	12.8% (-)	16.7%	33.3% (+)	χ2 (6, n= 306) = 23.31, p=.001
Phonological Awareness	10.9%	3.5% (-)	6.7%	17.0% (+)	χ2 (6, n= 304) = 22.35, p=.001

(+) indicates significantly greater than the average score

(-) indicates significantly less than the average score

Table 7.2 Areas of significance for frequency of SLPs working in DLI tabulation of tests from CELF-4 across years of experience

CELF-4 Index Score	Average (%)	Years of Experience		p Value
		≤ 10 years	>10 Years	
Language Structure	22.9%	15.4%	27.7%	χ2 (3, n= 303) = 10.14, p=.02
Language Content	23.8%	17.6%	27.7%	χ2 (3, n= 301) = 13.05, p=.005
Working Memory	19.3%	13.4%	23.1%	χ2 (3, n= 305) = 12.90, p=.005
Supplementary Test	Average (%)	Years of Experience		p Value
		≤ 10 years	>10 Years	
Pragmatic Profile	17.2%	10.9%	21.3%	χ2 (3, n= 302) = 14.04, p= .003
Rapid Automatic Naming	12.7%	5.9%	17.1%	χ2 (3, n= 306) = 11.55, p=.01
Word Association	15.7%	7.6%	20.9%	χ2 (3, n= 306) = 18.59, p=<.001
Phonological Awareness	22.0%	6.0%	13.9%	χ2 (3, n= 304) = 8.54, p=.04

SLPs working in DLI in AUS/NZ showed that although they usually did level 1 and 2 testing, they were significantly less likely to complete the other subtests of the assessment. SLPs in the UK, on the other hand, did not use the subtests as frequently as did SLPs in the other countries. As shown in Table 7.2, SLPs with more experience were significantly more likely to conduct aspects of level 3 and 4 testing. For SLPs working in Paediatric TBI, there were no significant differences across countries studied, but as shown in Table 7.3, the trend of tabulation was similar to SLPs working in DLI. SLPs working in USA/CA tabulated scores more frequently than SLPs in AUS/NZ, and there were no SLPs working in UK or AUS/NZ who routinely used the PP and ORS. There was however a significant difference between SLPs working in either an inpatient or community setting who used the PP and ORS: more than 90% of SLPs in an inpatient setting infrequently or never used the

PP/ORS ($\chi 2$ (3, n= 60) = 9.42, p=.02). There were some trends in the data: it was highlighted that the CL, RL, and EL were used in a similar frequency across an inpatient and community setting, but other index scores, namely LS, LC, and WM, and supplementary tests were used more often in a community setting.

Factors such as years of experience did not create any significant differences in the tabulation of index scores or supplementary tests. However, results did highlight a trend with SLPs with more years of experience more likely to routinely tabulate the LS, LC, and LM. There was no difference with WM and PP/ORS.

Table 7.3 Tabulation of CELF-4 index scores and supplementary tests by SLPs working in TBI by country of workplace

CELF-4 Index Score & Supplementary Test	Average (%)	Country of Origin (SLPs TBI)		
		AUS/NZ	UK	USA/CA
Core Language	63.3%	71.4%	33.3%	65.2%
Receptive Language	65.0%	71.4%	44.4%	65.2%
Expressive Language	65.0%	71.4%	44.4%	65.2%
Language Structure	40.0%	32.1%	22.2%	56.5%
Language Content	41.7%	32.1%	33.3%	56.5%
Language Memory	33.3%	28.6%	22.2%	43.5%
Working Memory	20.0%	10.7%	33.3%	26.1%
Pragmatic Profile/Observational Rating Scale	6.7%	0.0%	0.0%	17.4%
Rapid Automatic Naming	8.5%	7.1%	11.1%	9.1%
Word Association	18.3%	14.3%	33.3%	17.4%
Phonological Awareness	8.3%	3.6%	0.0%	17.4%

7.4.   SLPs working in DLI proposed use of CELF-4 for a child with a TBI

There were no changes in the frequency of tabulation for the CL, RL and EL, and LS and LC, but increases in frequency for WM and all supplementary tests when SLPs working in DLI were asked to report what aspects of the CELF-4 they would

tabulate. There was still variability in responses to frequency for level 3 and 4 testing. Overall, there was no change in clinical practice for level 1 and 2 testing (see Figure 7.2).
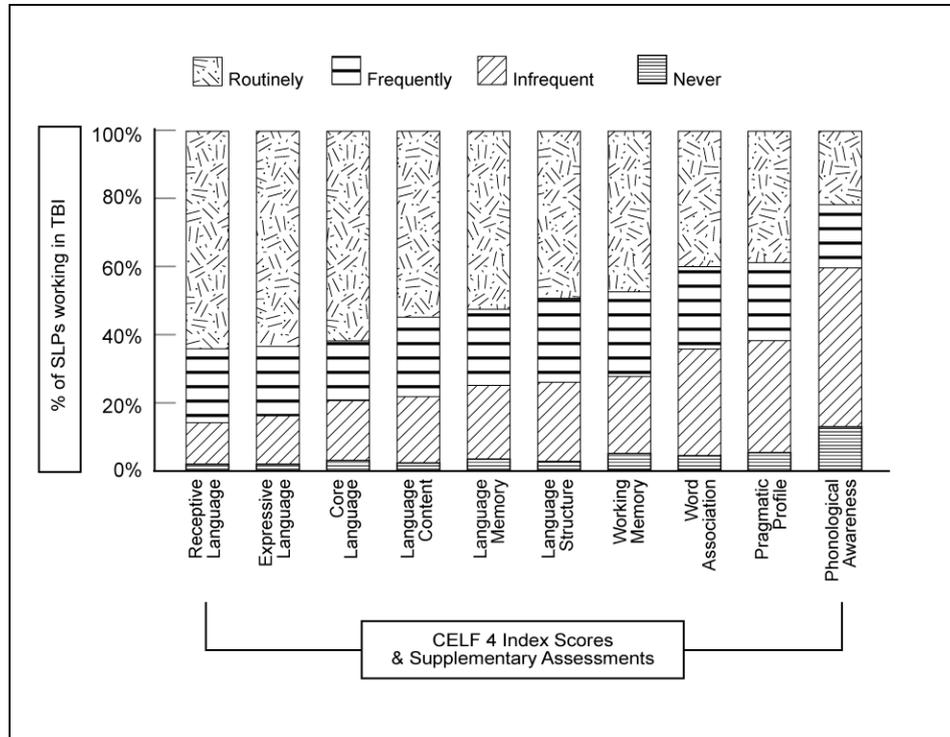
Figure 7.2 Frequency of SLPs working in DLI tabulation of tests from CELF-4 if assessing a child with TBI

Prior experience with a child with a TBI did not influence the frequency of each index score or supplementary. In addition, factors such as country of origin or years of years of experience as an SLP did not highlight any changes in the tabulation of scores in clinical practice.

7.5   CELF-4 subtest level of difficulty as reported by SLPs in DLI & TBI

As shown in Table 7.4a and 7.4b, SLPs working in DLI and TBI both agreed that formulating sentences (FS), understanding spoken paragraphs (USP), and concepts & directions (C&D) subtests were the most difficult subtests on the CELF-4.

They also agreed that the working memory subtests (numbers repetition, forward & backwards, and familiar sequences) were the least difficult. SLPs working in TBI rated recalling sentences (RS) lower in difficulty compared with SLPs working in DLI.

Table 7.4a CELF-4 ranking of complexity by SLPs working in DLI

	CELF-4 Subtest	% SLPs reported subtest definitely difficult
1	Concepts & Directions (C&D)	77.2%
2	Formulating Sentences (FS)	73.8%
3	Understanding Spoken Paragraphs (USP)	68.5%
4	Sentence Structure (SS)	64.5%
5	Sentence Assembly (SA)	64.4%
6	Semantic Relationships (SR)	63.5%
7	Word Classes Exp (9yrs+) (WC-E9)	62.9%
8	Word Classes Exp (5-8yrs) (WC-E5)	61.1%
9	Word Definitions (WD)	59.8%
10	Recalling Sentences (RS)	54.9%
11	Word Structures (WS)	54.7%
12	Word Classes Rec (5-8yrs) (WC-R5)	54.2%
13	Word Classes Rec (9yrs+) (WC	55.5%
14	Expressive Vocabulary (EV)	45.5%
15	Familiar Sequences (FS)	17.9%
16	Numbers Repetition Backward (NRB)	17.5%
17	Numbers Repetition Forward (NRF)	11.2%

Based on the ratings, subtests comprising the index score language content (LC) were identified as the most difficult on the CELF-4 by SLPs working in DLI and TBI. The working memory (WM) index score was rated as the easiest in comparison.

Table 7.4b CELF-4 ranking of complexity by SLPs working in TBI

	CELF-4 Subtest	% SLPs reported subtest definitely difficult
1	Formulating Sentences (FS)	71.2%
2	Concepts & Directions (C&D)	67.9%
3	Understanding Spoken Paragraphs (USP)	67.9%
4	Word Definitions (WD)	59.8%
5	Sentence Assembly (SA)	59.6%
6	Semantic Relationships (SR)	59.6%
7	Word Classes Exp (9yrs+) (WC-E9)	54.9%
8	Sentence Structure (SS)	54.0%
9	Word Classes Rec (9yrs+) (WC-R9)	52.9%
10	Word Classes Rec (5-8yrs) (WC-R5)	45.1%
11	Word Classes Exp (5-8yrs) (WC-E5)	45.1%
12	Expressive Vocabulary (EV)	44.2%
13	Word Structure (WS)	41.2%
14	Recalling Sentences RS)	40.4%
15	Numbers Repetition Backward (NRB)	11.8%
16	Familiar Sequences (FS)	8.2%
17	Numbers Repetition Forward (NRF)	7.8%

7.6. Impact of working memory on CELF-4 subtests as reported by SLPs in DLI & TBI

As shown in Figures 7.3a and 7.3b, SLPs working in DLI and TBI agreed that working memory (storage and processing) impacted on subtests C&D, RS, and USP, whereas subtests expressive vocabulary (EV), word structure (WS), and word definitions (WD) were less likely to see working memory impact on the ability to perform the task. There was a greater variability in responses for the working memory subtest familiar sequences (FS), with SLPs working in TBI rating it as having a lower working memory impact compared to other subtests. Other subtests with variability in responses about the certainty of whether WM was impacting on the

tasks included the word classes – expressive subtest (WC-E9 & WC-E5) the word classes – receptive subtest (RS) (WC-R5), and FS. Interestingly, RS was rated as the subtest with the highest impact of working memory but was also a relatively easier subtest to perform compared to others on the CELF-4. The receptive language index score had the most number of subtests high in working memory for both DLI and TBI, and the expressive language index score had the lowest number of subtests high in working memory.
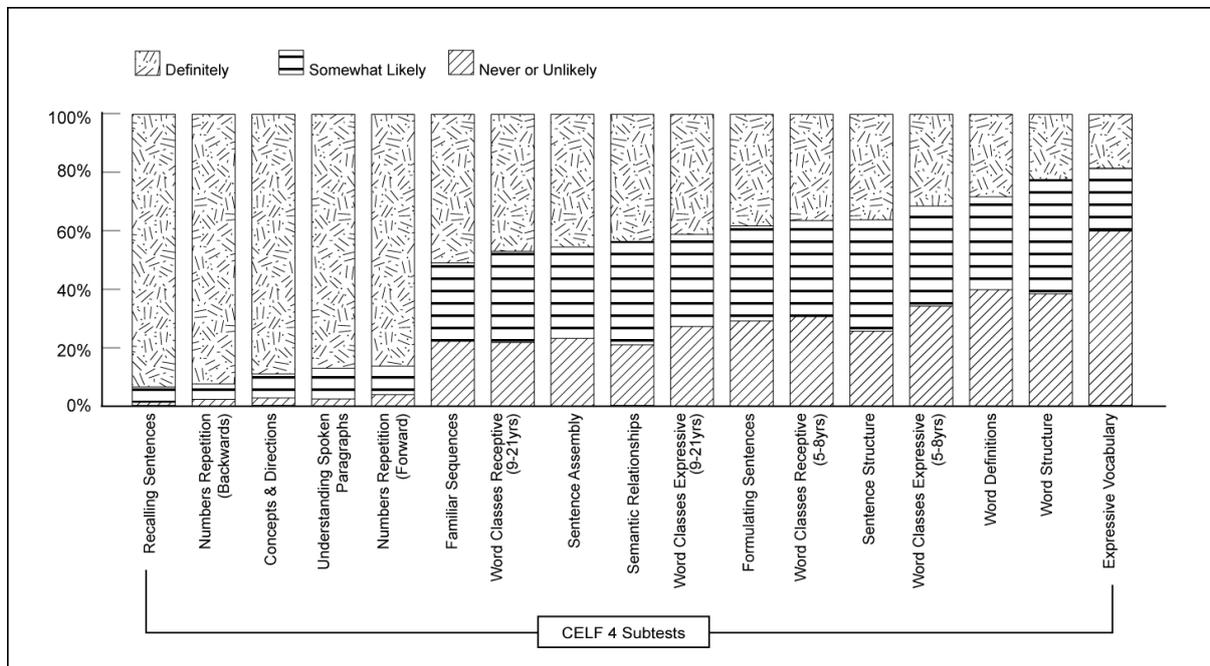
Figure 7.3a Ranking of working memory impact on CELF-4 subtest as reported by SLPs working in DLI
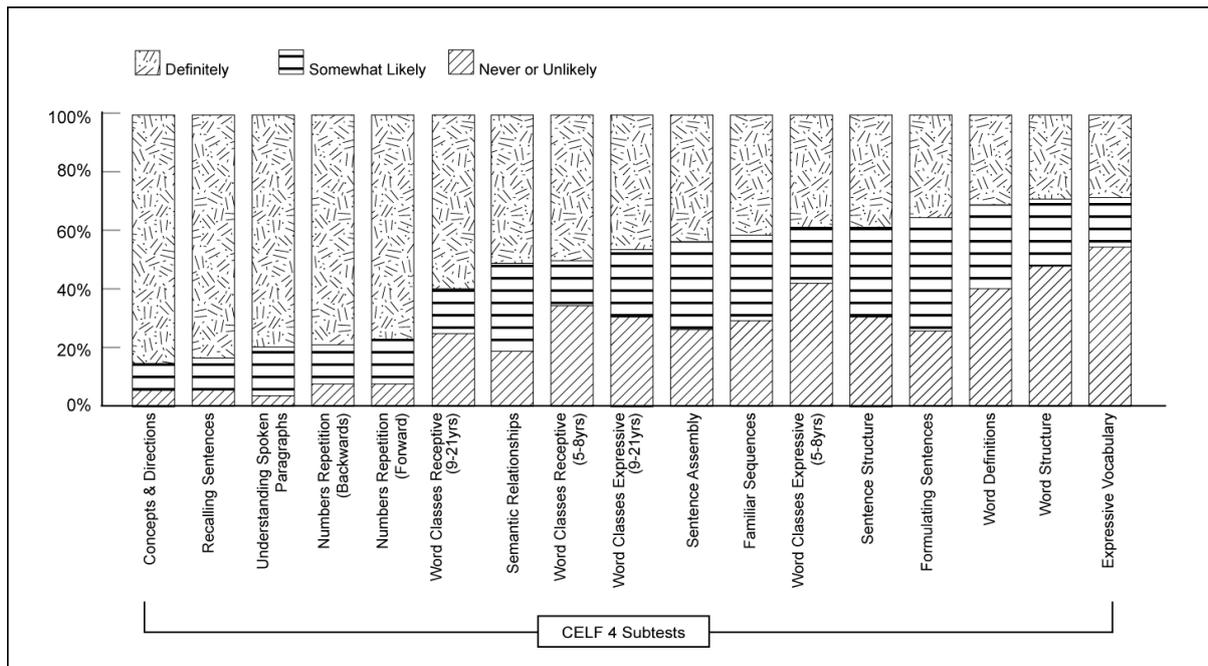
Figure 7.3b Ranking of working memory impact on CELF-4 subtest as reported by SLPs working in TBI

7.7. Perceptions and attitudes towards the CELF-4 in clinical practice by SLPs working in DLI and TBI.

There were no significant differences between responses on the Likert scale from the SLPs working in DLI and TBI. As shown in Figures 7.4a and 7.4b, there was strong agreement that the CELF-4 was evidenced based, that it was an assessment that accurately assessed receptive language, that it was an assessment you use according to its guidelines, and that it was a test used to compare with peers. However, there was strong disagreement that the CELF-4 was the only assessment to assess both receptive and expressive language, that it is only used because everyone else uses it, that it is an assessment reflecting performance outside the test environment, and that it was an assessment that assessed functional abilities. Moreover, there were statements about the CELF-4, and about these statements were varying attitudes of either agreement or disagreement. SLPs working in DLI

and TBI had mixed views that it was an assessment to use for future management or that it was the "gold standard" in assessing communication disorders in children. SLPs working in DLI and TBI did agree strongly though that the CELF-4 was an assessment where performance was interpreted based on individual subtests compared to index (summary) scores. There was also variability in the attitude that the CELF-4 accurately assessed expressive language skills.

7.8. Summary

In summary, SLPs working in both developmental language and paediatric brain injury use the CELF-4 in the same fashion by tabulating the core language, receptive language, and expressive language routinely. The assessment is less often used for tabulating language content, language structure, and language memory index score. In both groups, working memory was rarely tabulated. The only difference in the use of the CELF-4 is that the word association supplementary test was more likely to be used in TBI. There was common agreement that the CELF-4 was neither a test that showed functional implications nor that it could necessarily be used for the future management of the child. There was also agreement that it was evidence based and something to be compared with peers. Moreover, the assessment was regarded as able to be used to analyse the child's performance based on individual subtests rather than the index summary score. This does not imply, however, that the index summary score was not important.
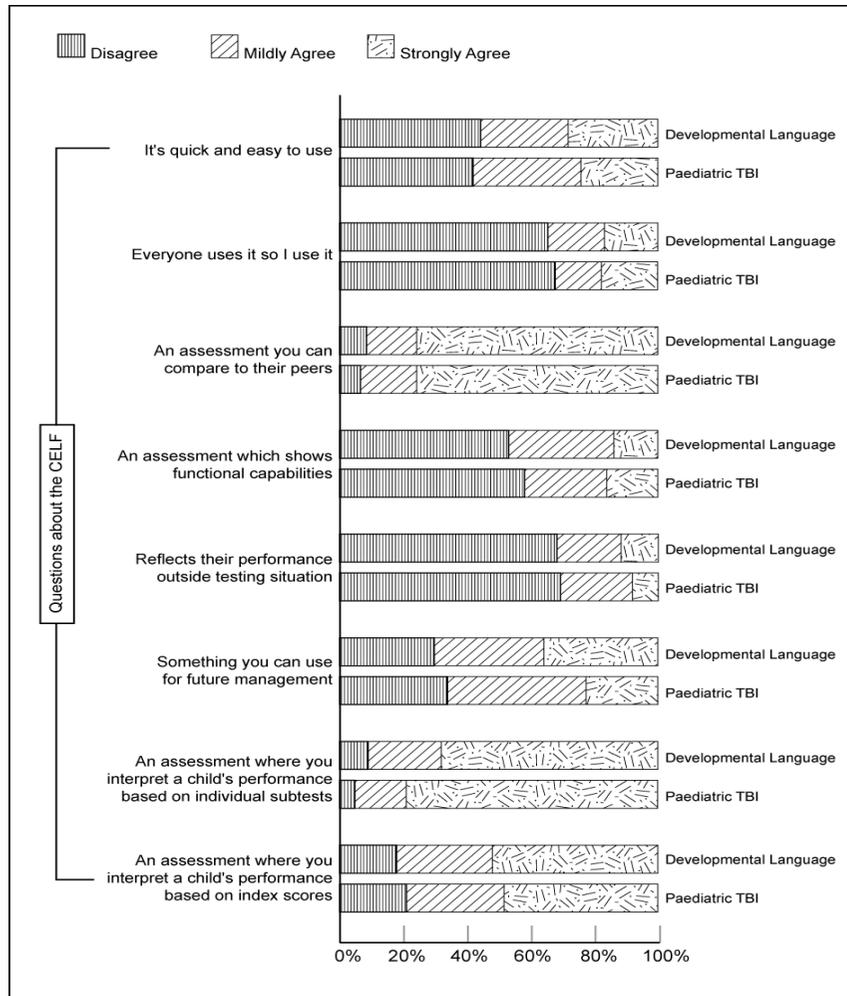
Figure 7.4a SLPs' attitude to the CELF-4 (DLI & TBI)
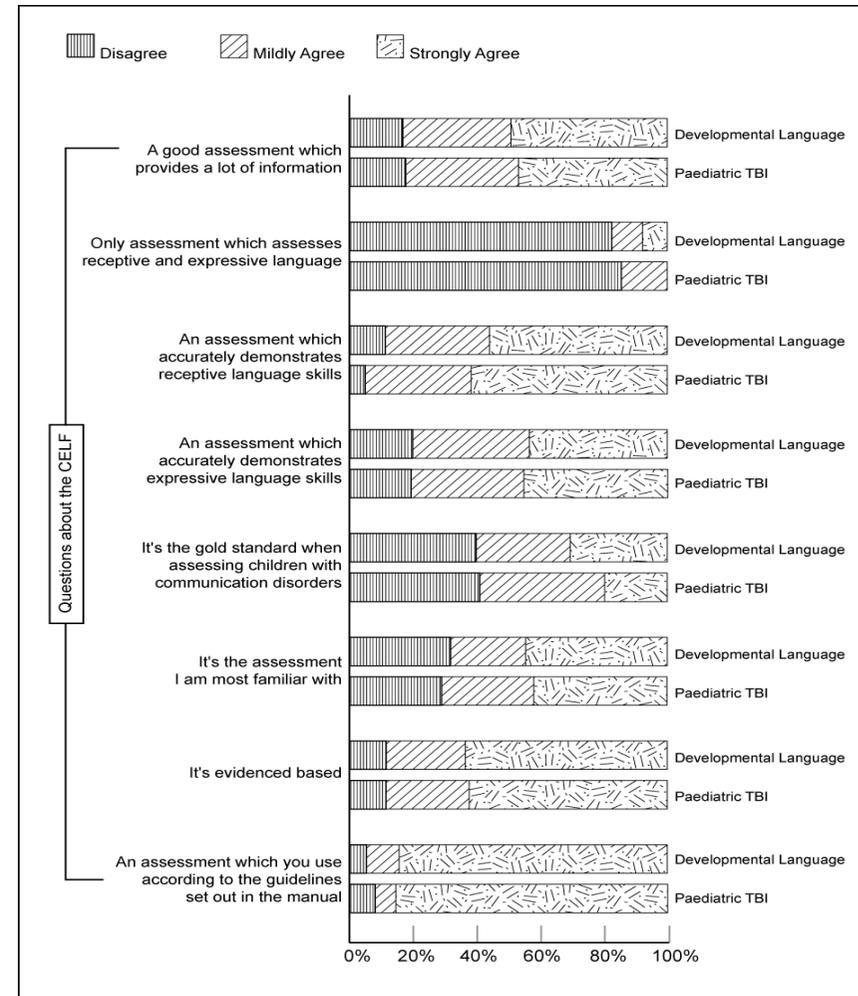
Figure 7.4b SLPs' attitude to the CELF-4 (DLI & TBI)

Chapter 8 - Results

Discourse Assessment: Informal and Formal Approaches

8.1 Introduction

Chapters 4, 5, 6, and 7 have focused on the standardised assessment tools used in clinical practice with SLPs that work in adult and paediatric TBI and paediatric DLI. Chapter 8 will now focus on discourse approaches in clinical practice. Specifically, the use of informal discourse procedures, defined as a general observation of clients' communication skills that provides a global overview, and a formal discourse assessment, defined as an assessment that involves data analysis.

The results will examine the frequency of which these assessments are conducted in clinical practice and will look at setting of care, years of clinical experience, and the SLP's country of origin as factors that could influence choice and frequency. It will also look at the types of genres used to assess discourse. Finally, it will review the attitudes of SLPs towards their knowledge and application of discourse assessment in clinical practice. Comparisons between and within clinical groups will be discussed.

8.2 Informal versus formal discourse assessment

Over 60% of SLPs working in adult TBI reported that they routinely conducted an informal discourse assessment, something reported to be done by only a third in paediatric DLI and TBI (see Figure 8.1a, b, and c). These figures were statistically significant with SLPs working in adult TBI (χ2 (6, n= 641) = 62.2, p=<.001). In all three clinical groups, formal discourse assessments were predominately conducted infrequently, and more SLPs working in paediatric DLI reported never having

conducted a formal discourse assessment. SLPs working in paediatric TBI were significantly more likely to conduct a formal discourse frequently compared to other SLPs working in adult TBI and paediatric DLI (χ2 (6, n= 640) = 25.21, p<.001), but these figures still comprised less than a third of all SLPs studied. Factors such as country of origin, years of clinical experience, and setting of care did not influence the frequency or type of discourse assessment performed by SLPs working in all three clinical groups.

8.3   Genres used to assess discourse

Conversation between the client and clinician was the most frequently used approach to assess discourse for all SLPs working across the three clinical groups. Pragmatic skills were routinely assessed by half of the SLPs working in adult TBI, but only a third of the SLPs routinely examined pragmatic skills as part of a discourse assessment. This was statistically significant (χ2 (6, n= 649) = 47.96, p<.001). Conversely, there was a statistically significant difference when it came to conversation between the client and significant other, with SLPs working in paediatric TBI routinely assessing discourse via this method compared to SLPs working in adult TBI and paediatric DLI who did not (χ2 (6, n= 646) = 43.49, p<.001). However, this was still less than a third of all SLPs (see Figure, 8.1a, b and c.). Overall, SLPs working in adult TBI and paediatric DLI were statistically different in the frequency of genres used in clinical practice, with SLPs working in DLI routinely using most genres less frequently, while SLPs working in adult TBI were using a variety of genres routinely (see Table 8.1).

Table 8.1 Difference in genres used routinely in clinical practice

Discourse Genre	Average%	Routine % for each clinical group			p value
		Paed DLI	Paed TBI	Adult TBI	
Narrative	26.3%	22.3%	24.2%	32.4%	(χ2 (6, n=643) = 13.16, p=.04).
Procedure	15.7%	7.0%	13.1%	28.2%	(χ2 (6, n=631) = 79.95, p<.001).
Conversation (clinician/client)	54.1%	43.4%	54.8%	68.9%	(χ2 (6, n=647) = 52.86, p<.001).
Description	24.6%	14.9%	19.4%	39.2%	(χ2 (6, n=642) = 70.48, p<.001).
Recount	19.0%	13.3%	19.7%	26.9%	(χ2 (6, n=627) = 24.29, p<.001).
Conversation (client/sig other)	21.5%	18.0%	31.7%	23.7%	(χ2 (6, n=646) = 43.49, p<.001).
Pragmatics	33.4%	25.7%	29.0%	45.5%	(χ2 (6, n=649) = 47.96, p<.001).
Exposition	4.8%	3.0%	3.3%	7.5%	(χ2 (6, n=631) = 39.10, p<.001).
Argument	3.3%	2.7%	0.0%	4.9%	(χ2 (6, n=639) = 42.17, p<.001).
Persuasion	3.4%	3.0%	0.0%	5.0%	(χ2 (6, n=638) = 39.10, p<.001).

In addition, genres such as exposition, argument and persuasion were statistically different with SLPs working in adult TBI, though overall, these genres were more likely to never to have been used in clinical practice.

Factors such as years of experience highlighted that SLPs working in adult TBI were significantly more likely to assess narrative (χ^2 (3, n= 243) = 13.60, p=.004) and pragmatic skills (χ^2 (3, n= 243) = 8.31, p=.04) in clinical practice. Years of experience did not influence SLPs working in paediatric TBI and DLI. Setting of care or country of origin did not influence the genre.

8.4 SLPs' attitude towards discourse (knowledge and application)

8.4.1 Knowledge of discourse

There was agreement among SLPs working across the three clinical groups that discourse analysis was an important component of a discourse assessment, with the proportion of agreement being higher among those working in adult TBI than in paediatric DLI (χ^2 (4, n= 628) = 10.82, p=.03). In addition, while the majority of SLPs agreed that they understood what discourse was, there was a significant difference in this understanding between SLPs working in adult and paediatric TBI and those in paediatric DLI, the latter reporting lower levels of agreement towards their understanding of what discourse was (χ^2 (4, n= 615) = 11.86, p=.02). All the SLPs had mixed attitudes towards knowing what to analyse in a discourse assessment and whether it changed the management of the client in clinical practice. There were also higher levels of disagreement in statements that it was the gold standard in communication assessment and that carers or others in the care or rehabilitation of the client were interested in discourse results (see Figure 8.2a, b and c.).

8.4.2 Application of discourse

There were no significant differences between SLPs on attitudes towards their application of discourse in clinical practice. The majority of SLPs across all clinical groups reported that they would not use a discourse assessment as their first assessment tool and disagreed that they knew of discourse assessments to use in clinical practice. They all agreed that a discourse assessment should include an assessment of pragmatic skills, but there were mixed results regarding how comfortable they felt assessing discourse, whether they would use a discourse

assessment to monitor progress, and whether discourse analyses were time consuming. See Figure 7.3a, b and c.

8.5   Summary

The preferred method of discourse assessment was the use of informal methods, in which no data analysis was involved after the assessment and a general observation was performed. SLPs working in adult TBI conducted informal discourse assessments the most frequently. Formal discourse assessments were not routinely used by all SLPs, but SLPs working in paediatric TBI were more likely to conduct a formal discourse assessment out of the three clinical groups, however. The genre most used in clinical practice was a conversation between the client and clinician, and SLPs working in adult TBI were more likely to assess pragmatic skills and use a variety of genres in clinical practice.

None of the SLPs across the three clinical groups knew of discourse assessments that they could use in clinical practice, and there was variability amongst SLPs about how comfortable they felt in assessing discourse and what to analyse. SLPs working in paediatric DLI were less likely to agree than those in adult TBI that discourse assessment was an important component of a communication assessment and about their knowledge of discourse assessment. Finally, there was variability amongst SLPs that discourse assessment did change the management approach to their client.

In summary, the results section has detailed an overview of the standardised assessment tools used in clinical practice by SLPs working across adult and paediatric TBI and paediatric DLI. It has also highlighted the informal methods used within clinical practice. Regarding SLPs working in paediatrics, the results section

has highlighted how the CELF-4 (Semel et al., 2003) is used within clinical practice. In addition, it has emphasized the differences and similarities between the tools and approaches for the three clinical groups, which will now be discussed in Chapter nine, detailing the clinical and research implications for the Speech Pathology profession and where to next in this area of research.

Figure 8.1a

SLPs working in adult TBI reported frequency of informal and formal discourse approaches and genres used
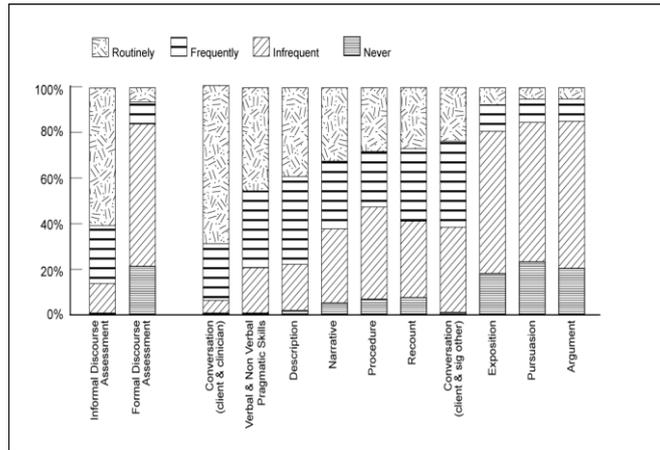
Figure 8.1b

SLPs working in paediatric DLI reported frequency of informal and formal discourse approaches and genres used
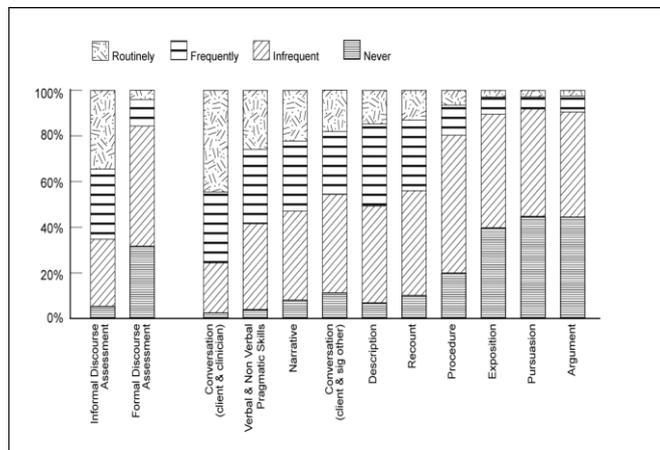
Figure 8.1c

SLPs working in paediatric TBI reported frequency of informal and formal discourse approaches and genres used
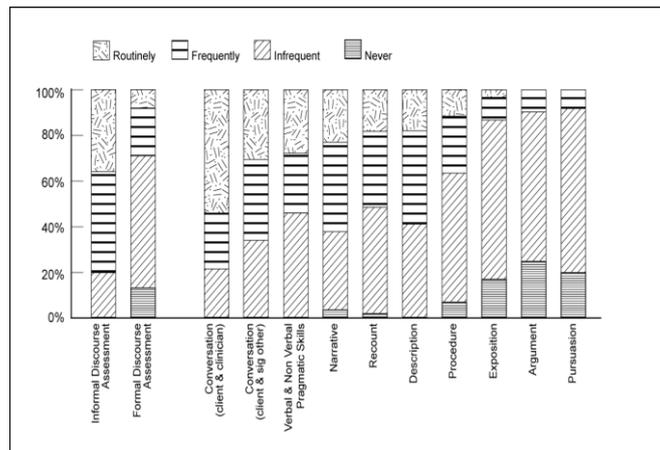
Figure 8.2a

The attitude of SLPs working in adult TBI towards knowledge of discourse
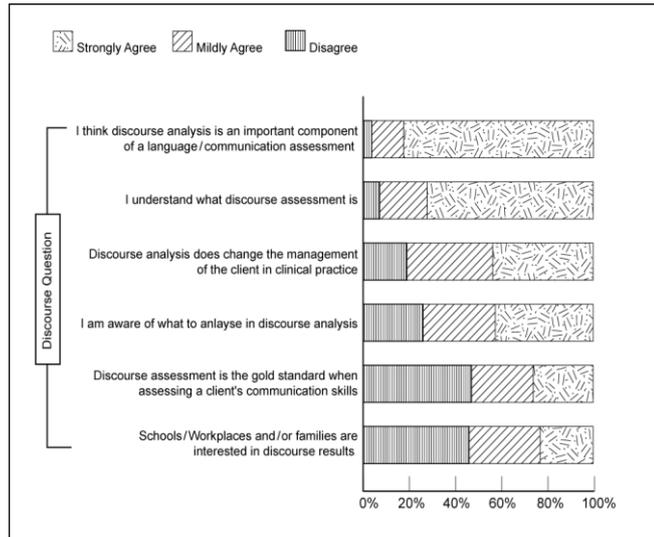
Figure 8.2b

The attitude of SLPs working in paediatric DLI towards knowledge of discourse
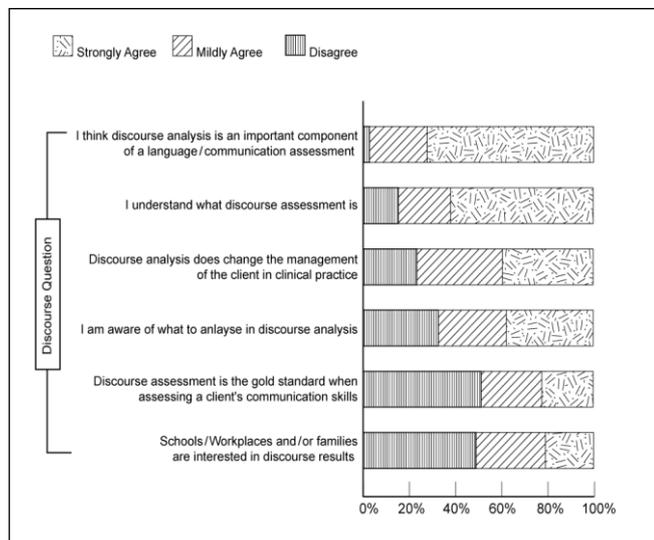
Figure 8.2c

Attitude of SLPs working in paediatric TBI towards knowledge of discourse
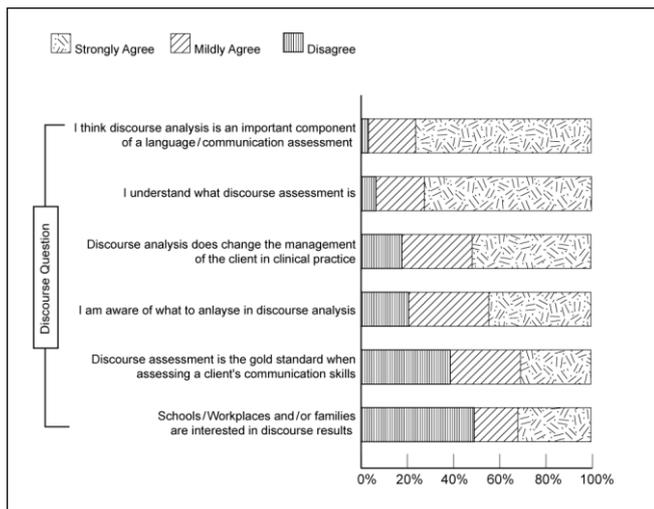
Figure 8.3a

Attitude of SLPs

working in adult TBI

towards application
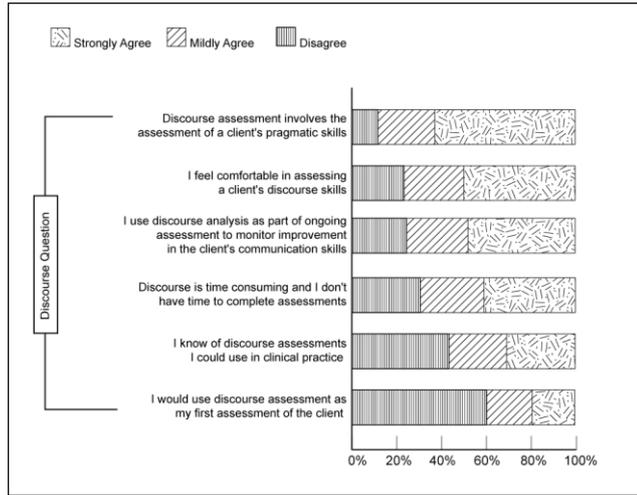
discourse

Figure 8.3b

Attitude of SLPs

working in

paediatric DLI

towards application
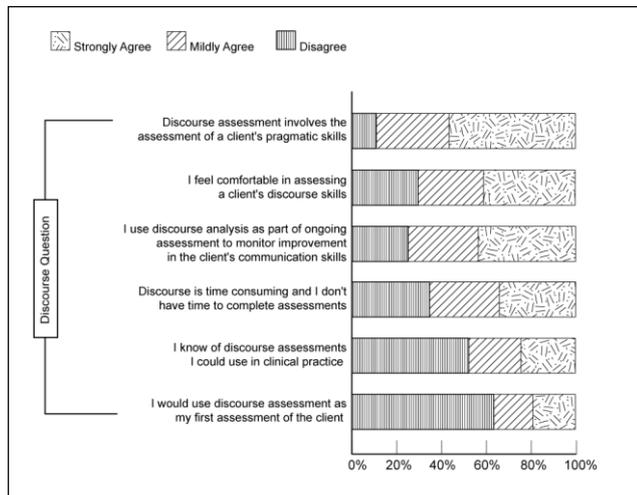
of discourse

Figure 8.3c

Attitude of SLPs

working in

paediatric TBI

towards application

of discourse
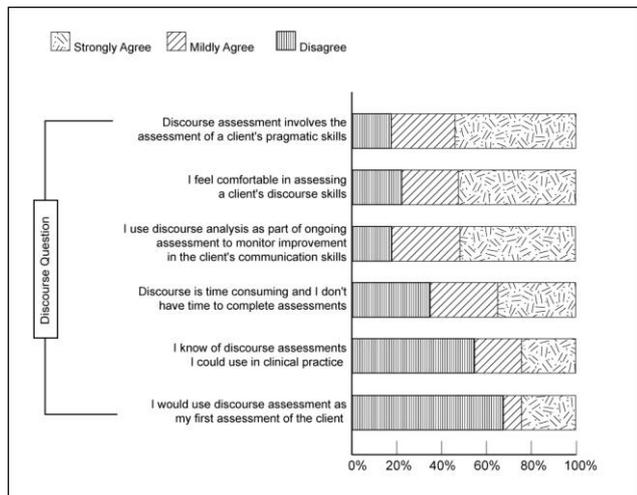
Chapter 9 – Discussion

9.1   Overview of study

An assessment is pivotal for the Speech Language Pathologist (SLP) to support clinical reasoning and decision-making. The results of assessments are used when working with the adult or paediatric client and their families to formulate goals and a management plan. This study has embarked on describing and comparing the assessment practices of SLPs working in three key clinical specialities: (1) adult traumatic brain injury (TBI); (2) paediatric developmental language (DLI); and (3) paediatric TBI.

The primary aims of the study were to identify;

1) The areas of communication frequently assessed in clinical practice. The question was whether the approach was different between the SLPs working across the three clinical groups and it was hypothesised that SLPs working in adult TBI would focus on functional communication more frequently than SLPs working in paediatric TBI and DLI.

2) The assessment tools used by SLPs to evaluate language and cognitive communication in each area of clinical speciality. The question was whether assessment tools change between SLPs working in paediatric TBI and DLI and it was hypothesised that the assessment tools would be similar.

3) The differences between assessment practices in adult TBI, paediatric TBI, and paediatric DLI. The question asked what tasks SLPs used to assess discourse and it was hypothesised that formal discourse

assessment would not be utilised by the majority of the SLPs working in the three clinical groups.

4) The factors such as country, setting, and clinical experience impacting on clinical assessment practices. The question was whether these factors impacted on clinical assessment practices and it was hypothesised that countries with a clinical guideline in the area of language or cognitive communication would have different assessment practices to those who had no such guidelines.

5) How the assessment tool CELF-4 (Semel et al., 2003) is used by SLPs working in paediatric TBI and DLI. The questions was whether the CELF-4 was used differently between SLPs working in paediatric TBI and DLI and it was hypothesised that it would be used in a similar manner focusing on the core language, receptive language and expressive language summary scores.

Despite the importance of a clinical assessment and the need for evidence-based practice, there is a paucity of literature identifying which tools are used internationally by SLPs. The results of this international survey of SLP practice informs clinical assessment practices of SLPs and provides additional information for future research.

9.2   Assessment practices of SLPs working in adult TBI

When assessing adults' communication skills after a TBI, SLPs overall

reported assessing functional communication skills as the most frequently used in

clinical practice, followed by receptive and expressive language skills. Areas of

communication considered to be sensitive to TBI (King et al., 2006; McDonald et al.,

2003), such as pragmatic skills, word-finding skills, higher-level language abilities,

discourse, literacy, and problem solving skills, were not routinely assessed by SLPs.

In particular, discourse/pragmatic skills assessment tools were used by less than

10% of the SLPs surveyed. Discourse assessments currently in use included

checklists such as the La Trobe Communication Questionnaire (LCQ; Douglas et al.,

2000) or the social communication assessment The Awareness of Social Inference

Test (TASIT; McDonald et al., 2003), both of which have robust validity and reliability

(Douglas et al., 2007; McDonald et al., 2003). Results about discourse assessment

confirm that perceived time taken and difficulty with transcription, training, the

decision process regarding the type of assessment/tool, and difficulty translating the

findings into clinical practice may possibly remain as deterrents for SLPs in

implementing discourse analysis within clinical practice (Coelho, 2007).

While functional communication was rated as the most routinely assessed

area of communication, impairment-based assessments designed for aphasia and

high-level language were noted as those used most prevalently by SLPs

internationally. To date, only one assessment in this category has been

recommended for use in adult TBI (Turkstra et al., 2005b), the Western Aphasia

Battery (WAB; Kertesz, 2006). However, other aphasia assessments such as the

Psycholinguistic Assessment of Language Processing in Adult Acquired Aphasia

(PALPA; Kay et al., 1992), Comprehensive Aphasia Test (CAT; Howard et al., 2004),

and Boston Diagnostic Aphasia Examination (BDAE; Goodglass & Kaplan, 2000) are used in clinical practice. Further research evaluating their clinical utility with the TBI population is warranted given impairment-based aphasia tools are reported in the literature not to be sensitive to TBI nor considered appropriate to the target function in everyday life (Larkins, 2007). Most of the assessments commonly used in studies examining cognitive communication impairments in TBI were not identified by this study as preferred assessment tools in clinical practice. An exception was the Scales of Cognitive Ability for Traumatic Brain Injury (SCATBI; Adamovich & Henderson, 1992), which has been used in some studies for mild TBI (Parrish et al., 2009; Wong et al., 2010).

9.2.1   Factors influencing assessment practices clinical practice

9.2.1.1 Different assessment practices across countries

Differences were noted between the countries represented in the survey regarding the assessment of specific areas of communication as well as the assessment tools used. In the USA and Canada (USA/CA), SLPs more frequently assessed problem-solving, written language, and reading than did their colleagues in Australia/New Zealand (AUS/NZ) and the United Kingdom (UK). As revealed by past research (Ellmo et al., 1997), SLPs in the USA used a high number of cognitive assessments, which may be a reflection of guidelines distributed in USA and Canada (American Speech-Language-Hearing Association, 2005; American Speech-Language Hearing Association, 2003; College of Audiologists and Speech-Language Pathologists of Ontario, 2002) that highlight cognition as an area of assessment for the SLP. But what does this mean for clinical practice?

The role of the SLP in regards to cognition assessment has been described as an overlapping role between SLPs and neuropsychologists (Wertheimer et al., 2008). In one study, neuropsychologists saw the role of SLPs to assess cognition as part of an assessment of communication, however they acknowledged there was very little collaboration with pre-assessment planning between the two professions. This in turn had implications for the integrity of psychometric assessments and the reporting of results as each discipline has its own interpretation and perspective view (Wertheimer et al., 2008). In this study, SLPs reported using a wide variety of cognitive assessments, including memory, attention, executive function, or intelligence. Despite this, the profession still knows very little about how SLPs use information about cognition to inform their clinical practice or whether the use of these cognitive assessment tools potentially duplicates roles provided by other professions.

The results of the present study demonstrated that cognitive communication and high-level language assessments (CC/HLL) were used significantly less by SLPs in the USA/CA compared to AUS/NZ. The most widely used CC/HLL assessments in AUS/NZ and the UK were the Mount Wilga High Level Language Test (MWHLL; Christie et al., 1986) and the Measure of Cognitive Linguistic Ability (MCLA; Ellmo et al., 1995). SLPs in Australia had previously identified the MWHLL (Christie et al., 1986) as a preferred assessment tool for use in adults with aphasia (Katz et al., 2000; Vogel et al., 2010). This is a consistent finding in the current study, demonstrating its popularity with adult TBI patients as well. This is an interesting finding considering that there is no known empirical research or normative data supporting its use in clinical practice to date. The MWHLL assessment is available online free (for example www. Libguides.city.ac.uk), and this may influence the

SLP's choice based on availability rather than on psychometric robustness or evidence-based practice. If this assessment has such popularity, further research is warranted to establish the appropriateness of this assessment with the TBI population. Once again, this study may further support previous research indicating that SLPs do not place great emphasis on statistical properties of an assessment when choosing an assessment tool (Frank & Barrineau, 1996). The use of assessments with psychometric robust properties needs to be addressed to maintain the integrity of SLP assessment practices within the profession.

Discourse/pragmatic assessment tools represented a smaller proportion of tools that SLPs surveyed in this study reported using. This category was noted to be more prevalent in AUS/NZ settings. This may reflect that the stated assessments of choice were more commonly developed locally, with the potential for AUS/NZ-based SLPs to have had more exposure to these tools via workshops or conferences which have been reported to be an effective method of promoting assessment choice (Frank & Barrineau, 1996). Similarly, the use of The Functional Assessment of Verbal Reasoning and Executive Strategies (FAVRES; MacDonald, 2003) in the assessment of functional performance category was noted as more popular in the USA/CA, which is also where it originated. These findings suggest that an influencing factor for SLPs when selecting assessments may be whether they are developed locally.

Naming assessments were used significantly less in AUS/NZ. The main tool, the Boston Naming Test (BNT; Kaplan et al., 2001), has been described as a tool used by neuropsychologists when examining their clinical assessment practices (Rabin et al., 2005). Cognitive assessments were also rarely used by SLPs from

AUS/NZ, which may reflect role delineation between neuropsychologists and SLPs in those countries.

Use of informal language/cognitive measures were not considered as a preferred method of assessment by SLPs in the UK and the USA/CA, with less than 3% and 5% respectively using them. Conversely, closer to 10% reported their use in the AUS/NZ group. Tools that were selected from this category focused mainly on observations of either non-specific functional activities or assessments developed by the clinician. Observation is one form of informal assessment previously reported to be a preferred choice both for TBI and aphasia patients (Frank & Barrineau, 1996; Simmons-Mackie et al., 2005; Vogel et al., 2010). However, further research is required about the validity of observation given there is no normative data to support decision-making and depending on the context there is individuality of communication styles in different settings (Togher, 2001).

9.2.1.2 Different assessment practices across clinical settings

The survey conducted as part of the present investigation highlighted that, overall, SLPs do not report assessing a particular area of communication more frequently irrespective of clinical setting, whether inpatient or community. Most assessments were used equally across both settings. However, it was noted that discourse and pragmatic skill assessment tools were significantly more likely to be used in a community setting. As clinicians consider that discourse and social skills play a significant role in re-establishing peer relationships and re-integrating back to work (Isaki & Turkstra, 2000), it is possible that SLPs specifically target social communication in their assessment and rehabilitation practices in order to support reintegration back into the community.

Methodological issues, such as practice effects on repeated measures, need to be reviewed given the lack of change in assessment tools between inpatient and community settings. The possible use of re-testing with the same assessment within short time frames has clinical implications for the integrity of an assessment and further research is warranted in this area.

9.2.1.3   *Different assessment practices across SLP's years of experience*

Areas of communication which are more specifically impacted or sensitive to TBI (King et al., 2006), such as pragmatic skills, discourse word-finding ability, and literacy, were more likely to be more frequently assessed by experienced clinicians. However, the tools selected in the assessment of these areas of communication were not significantly different according to years of experience. Previous research has highlighted that clinicians do not feel adequately trained to assess people with TBI at an undergraduate level, and that experience with TBI is learnt through exposure, mentoring from experienced staff, and workshops (Frank & Barrineau, 1996). Additionally, findings of the present study suggest that less experienced SLPs in AUS/NZ work in regional and rural areas, often times employed as a sole or generalist clinician, where they may not have access to appropriate assessment tools or support in deciding which tools to use. The importance of continued education and training is supported by such reports of inconsistent use of assessments targeting those areas of communication known to be most commonly impacted by a TBI (Bernicot & Dardier, 2001; McDonald et al., 2003; Turkstra & Kennedy, 2005), regardless of the SLP's experience. The development of prescriptive guidelines worldwide may also prove useful, suggesting which areas of communication should be assessed and the tools that could be used as part of an

assessment protocol to address not only impairment but also tools that reflect functional activities and participation in the community (Hughes & Orange, 2007). Training programs linking rural clinicians with metropolitan clinicians is also recommended. They have been proven as an effective method in mentoring and supporting allied health professionals in these settings (Parkin, McMahon, Upfield, Copley, & Hollands, 2001).

9.2.2   Summary

In conclusion, this study is the first to document international assessment practices of SLPs working with adults who have a cognitive communication disorder after a TBI. Similarities between countries highlights that traditional impairment-based aphasia tools continue to be favoured, with less focus on specific functional assessment tools. Yet overall SLPs working in adult TBI reported routinely assessing functional communication skills. Guidelines regarding the role of SLPs when assessing cognitive communication disorders were noted to have influenced change in assessment practices in some countries, notably the USA and Canada, with cognitive assessment tools forming an important part of a clinical assessment protocol. Australia, New Zealand, and the UK, being countries without guidelines, focus on assessment protocols from the field of aphasia and use aphasia and/or cognitive communication/high-level language assessments. The use of discourse in clinical practice is still not used readily as part of an assessment protocol. The study supports the need for clearer recommendations and guidelines about assessment protocols for assessment of cognitive communication disorders after a TBI.

9.3   Assessment practices of SLPs working in paediatric DLI

Receptive language and expressive language were the key areas of communication assessed by SLPs working in paediatric DLI. The most frequently used tool in clinical practice by SLPs was the Clinical Evaluation of Language Fundamentals Fourth Edition (CELF 4; Semel et al., 2003), a standardised developmental language assessment that can tabulate a score for receptive and expressive language. Next most frequently used was the Peabody Picture Vocabulary Test (PPVT; Dunn & Dunn, 1997; Dunn & Dunn, 2007), which measures vocabulary skills by matching a word to a picture. After receptive language and expressive language, receptive vocabulary was the next most frequently assessed area of communication, yet in contrast with the other two, there was variability regarding how frequently SLPs assessed it.

The results of this study concur with previous research conducted in the USA (Betz et al., 2013; Caesar & Kohler, 2009; Huang et al., 1997), finding that the CELF (Semel et al., 1995, 2003) and PPVT (Dunn & Dunn, 1997, 2007) and their various editions are popular assessments in clinical practice. They also reveal the popularity of these assessments across major English-speaking countries, in turn highlighting some of the similarities in assessment tools used by SLPs internationally.

The CELF-4[3] was the most widely used assessment tool in clinical practice, with almost all SLPs using it. The majority of all other tools were used infrequently, revealing a strong commitment to one assessment to fulfil the assessment needs of SLPs working in this area. An omnibus test, little is known about how SLPs use the CELF-4 in clinical practice. Betz et al. (2013) highlighted that omnibus tools were

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[3] The CELF-4 will be referred to repeatedly throughout the rest of this chapter. In order to enhance readability, hereafter the full bibliographic reference will not be provided

popular as they have many areas of language/communication to assess and can provide an overview of a child's strengths and weaknesses. In addition, the CELF-4 had the highest satisfaction ratings in its ability to describe the child's strengths and weaknesses in communication as well as assist with goal setting and intervention planning.

Considering the CELF-4 has multiple components and is the most popular and widely used assessment tool, it is important to understand how it is used with the school-aged population. Doing so can also contribute to the overall understanding of how SLPs approach a clinical assessment and whether evidence-based practice is applied. This will be discussed later in this chapter.

The results suggest that general language abilities are assessed using standardised developmental language assessments. They also suggest SLPs working with school-aged children with a DLI possibly adopt a traditionalist assessment approach as described by Owens (2014). This approach is primarily a focus on psychometric assessments that support the SLP to decide whether the child's communication skills fall within or outside the normal range compared to their peers. Informal assessments comprised a small percentage of the overall types of assessments administered, suggesting standardised assessments may be more likely used in isolation. This would have clinical implications as to how SLPs use this information to inform clinical reasoning and formulate goals or management plans.

Results possibly suggest that an impairment-based approach may be used when looking at discrete areas of communication, like vocabulary, morphology, grammar, and syntax, and that intervention focuses on these areas. These types of resources are readily available from the authors of the CELF-4 in the form of work books based on the individual subtests. SLPs working in paediatric DLI can utilise a

variety of service delivery models. Regardless, the assessment tools and approach appear the same. More research is required to guide the clinician on tools that can be utilised that complement the frameworks discussed in Chapter 1. That is tools, which examine communication activities, participation, and context as important components within the assessment. Developmental standardised tools do not necessarily assess these aspects (Bishop & McDonald, 2009). It is well documented that school-aged children require an approach that is beyond an impairment model (Brandel & Loeb, 2012; Cirrin et al., 2010). DLI in school-aged children is recognised as a potential long-term disability (Friel-Patti, 1999). Therefore, an approach taking into account the longer-term needs of the child is required, one that moves beyond assessment and remediation of specific areas of language (Hollands et al., 2005).

Interestingly, specific assessments tools have been used to assess receptive vocabulary, which has been highlighted by previous studies as a frequently assessed area of communication (Betz et al., 2013; Huang et al., 1997). While this study concurred with results by Betz et al. (2013) and Huang et al. (1997), there were comparatively low SLPs satisfaction ratings for the ability of vocabulary assessment tools like the PPVT (Dunn & Dunn, 1997, 2007) and 100 Picture Naming Test (HPNT; Fisher & Glenister, 1992) to identify strengths and weaknesses or assist with goal setting and intervention. This raises questions then about why these types of tools were so popular yet not highly rated. Given that vocabulary development is important in literacy development and academic achievement (Roberts, 2005), vocabulary assessment tools may be used in the assessment process for other clinical reasons, such as measuring change over time in vocabulary development. This area requires further investigation to ascertain whether SLPs target these tools in clinical practice for the same reasons.

Nonetheless, vocabulary tools have been suggested that they not be used in isolation and should form part of an assessment battery (Owens, 2014). Results suggest that some of the SLPs recruited in the study use the PPVT in conjunction with the CELF-4.

Other areas of communication including pragmatic skills, discourse, and functional communication were routinely assessed by less than half of the SLPs recruited in the study. The variability around clinical practice highlight areas for future improvement around evidence based practice and consistency within clinical practice. Tools utilised to assess functional communication comprised only a small proportion of assessments used in clinical practice, but this may be a reflection of the limited number of assessments available for paediatrics. One assessment that looks at pragmatic skills and functional communication is the Children's Communication Checklist 2nd Edition (CCC-2; Bishop, 2003a). Although this infrequently used assessment was used by a quarter of the SLPs recruited, it was rated second after the CELF-4 in its ability to identify strengths and weaknesses in a child's communication skills. A rating scale completed by the parent/carer; the CCC-2 (Bishop, 2003a) assesses functional communication and social skills in a real-life context and was specifically designed to measure communication skills in children with autism and Asperger's syndrome. It has been shown to be useful and complimentary in standardised assessment testing by providing a more holistic description of the child's communicative strengths and weaknesses (Bishop & McDonald, 2009). It has the potential to meet the needs of SLPs working in DLI and assist in understanding the strengths and weaknesses of the child in their own environment, but only a small percentage of SLPs use it.

Discourse assessment tools such as the Renfrew Bus Story (RBS; Renfrew, 1991); the Expression, Reception, and Recall of Narrative Instrument (ERRNI; Bishop, 2004); and the oral expression subtest from the Weschler Individual Achievement Test (OE/WIAT; Wechsler, 2005) were used infrequently. Indeed, discourse assessments in previous studies have shown that the RBS was either rarely or never used (Betz et al., 2013; Huang et al., 1997). These discourse assessments were also rated lower in satisfaction ratings when identifying strengths and weaknesses or assisting with goal setting and intervention. These results suggest that discourse is possibly not an area of focus and that the assessments available are perceived less positively by SLPs in comparison to others available in clinical practice. These could possibly be further reasons why SLPs do not utilise discourse assessments in clinical practice. Informal assessment made up a very small percentage of assessment practices. Language sampling was not a frequently used methodology for informal assessments of language by the SLPs surveyed. Observation was the preferred method consistent with other studies surveying SLPs about clinical practice (Caesar & Kohler, 2009; Huang et al., 1997).

Literacy was a lower priority area for SLPs, with some never assessing, reading (decoding and comprehension), or written language, even though the associations such as ASHA (2001), identify how the important role SLPs play in supporting reading and writing in school aged children. Assessment tools examining literacy were utilised by a small percentage of SLPs. In comparison, phonemic awareness skills were more likely to be an area assessed, possibly a reflection of SLP services focusing on early intervention and literacy skills. However, SLP services for older school-aged children is not as well prioritised (Hollands et al., 2005), which may impact on what the SLP can provide for this age group and the

extent of assessments that can be applied for a lower-priority group. A variety of service delivery models have been discussed in the school-aged DLI group ranging from assessment only, consultation or integrated service delivery, depending on the setting of care (Elksnin & Capilouto, 1994). This may have an impact on what the SLP is able to assess. The Neale Analysis of Reading Ability (Neale, 1997) was rated highly by SLPs that assessed literacy for its ability to identify strengths and weaknesses and assist with goal setting. The Test of Written Language (TOWL-3; Hammill & Larson, 1996) was not rated as highly. These results provide suggestions to SLPs seeking a tool for assessing literacy.

9.3.1 Factors influencing assessment practices clinical practice

9.3.1.1 Different assessment practices across countries

Overall, there were some preferences for what was assessed in clinical practice and the assessment tools used across the three different country groups. SLPs working in the USA/CA demonstrated a preference for assessing receptive vocabulary and problem-solving skills more often than SLPs in AUS/NZ and the UK. This is possibly reflected in the tools used as well, with SLPs in the USA/CA routinely using the PPVT (Dunn & Dunn, 1997, 2007) and the Comprehensive Assessment of Spoken Language (CASL; Carrow-Woolfolk, 1999). These results are similar to previous studies from those countries (Betz et al., 2013; Caesar & Kohler, 2009). The CASL (Carrow-Woolfolk, 1999) is also an omnibus measure that includes tasks assessing vocabulary skills as well as high-level language skills or problem-solving skills in tasks such as inferences, meaning from context, and non-literal language.

As was the case with SLPs from the USA/CA, those from AUS/NZ and the UK also had preferences. Phonemic awareness skills were assessed more frequently in

AUS/NZ, a fact complemented by tests locally manufactured such as the School Age Oral Language Assessment (SAOLA; Leitão & Allan, 2003) and the Sutherland Phonological Awareness Test (SPAT; Neilson & Konza, 2008), assessments used primarily by SLPs in AUS./NZ only. Similarly, the Renfrew Action Picture Test (RAPT; Renfrew, 2003), a tool developed in the UK was reported to be used more frequently in the UK than in the other countries. These results highlight that SLPs do possibly tend to choose locally developed and published assessment tools, perhaps owing to more exposure to these tools via conferences and workshops in their local area. Such exposure has been highlighted as an effective method of promoting assessment choice in other clinical populations (Frank & Barrineau, 1996). This fact was further evidenced when noting the top five assessment tools from each country, with SLPs from the USA/CA and the UK predominately using tools from their own countries.

While the CELF-4 was popular across all countries, SLPs in AUS/NZ used it more routinely than the rest. Results also suggested that SLPs from AUS/NZ possibly used this assessment in isolation, with very few other assessment tools noted to be routinely used in clinical practice. Whereas, SLPs from the USA/CA reported a number of assessments that were routinely used in addition to the CELF-4. These included the PPVT (Dunn & Dunn, 1997, 2007) and the CASL (Carrow-Woolfolk, 1999). Whether these are alternative tools or used in conjunction with the CELF-4 needs further exploration Vocabulary assessments were used less frequently in the UK, with a preference for the RAPT (Renfrew, 2003), which was used nearly as often as the CELF-4. Even though the RBS (Renfrew, 1991) was in the top five for the UK and AUS/NZ, its use was infrequent, again understating that

no more than three assessment tools were used routinely in clinical practice in each country.

9.3.1.2 *Different assessment practices across SLP's years of experience*

Assessment practices by SLPs were not greatly influenced by the years of clinical experience they had. Indeed, only two areas of communication were reportedly assessed differently by SLPs with fewer than 10 years of clinical experience compared to those with more years. SLPs with fewer years of experience more likely assessed phonemic awareness. The link between phonemic awareness and language, phonology, and early literacy has become well entrenched (Hogan, Catts, & Little, 2005), which may be a reflection of what is taught in contemporary undergraduate programs. Likewise a reason is that SLPs place more awareness on the assessment of young school-aged children. One area that might have important implications for clinical practice is the incorporation of high-level language into assessments conducted by SLPs with more experience. The most frequently used tool, the CELF-4, measures general language abilities rather than high-level language abilities. The CELF-4 and its earlier editions have shown that children with potential language difficulties can perform well, highlighting a false positive result (Ballantyne et al., 2007; Bishop & McDonald, 2009; Webster et al., 2006). Other language tasks should be targeted to ensure that the results are representative of the child's communication skills. It is important for the SLP to understand that, should a child who is referred perform well on a standardised test, additional measures to examine high-level language and higher-level thinking skills (American Speech-Language-Hearing Association, 2004; Royal College of Speech & Language Therapists, 2005) should be incorporated. This is particularly important given the

development of language skills in school age children progresses in complexity, with

greater use of figurative language, use of inference, and use of vocabulary with

multiple meanings (Nippold, 2007).Education should be targeted focusing on the

need to apply additional measures beyond basic receptive and expressive language

as this might not be sufficient when assessing a school-aged child with a DLI.

9.3.2   Assessment choices for SLPs working in DLI assessing a child with a TBI

There have been no studies that have surveyed SLPs' use of assessment

tools when they have little or no experience in paediatric TBI. As SLPs working with

a school-aged population, it is possible that clinicians may be required to assess a

child of an aetiology or clinical diagnosis with which they have no prior experience;

however, there is a question of whether this changes the tools or approach in clinical

practice. SLPs did not identify any one consistent test that they might use in clinical

practice. Fewer SLPs reported using the CELF-4 frequently in contrast to assessing

a child with a DLI. Additional assessment tools SLPs reported they would use

comprised vocabulary or high-level language assessments. Across all areas of

assessment, there was variability in the frequency of use. The most frequently used

tools included a parent/carer questionnaire, informal discourse assessment, and an

assessment specifically targeting high-level language. Assessments that targeted

high-level language such as the TOPS (Huisingh et al., 2005) and Oral and Written

Language Scale (Carrow-Woolfolk, 1995) and the CASL (Carrow-Woolfolk, 1999)

were the assesments that were reported the most. Albeit infrequently, these

assessment tools were already commonly used with paediatric DLI. The Test of

Language Competence (TLC-E; Wiig & Secord, 1989), recommended for use with

the paediatric TBI population (Turkstra et al., 2005b), was rarely mentioned as a preferred tool by the SLPs and was rarely used with paediatric DLI.

Interestingly, prior experience with paediatric TBI did influence the frequency of certain assessments in clinical practice. SLPs with previous experience assessing a child with a TBI were less likely to conduct an informal discourse or high-level language assessment, assessments that have been more specific in identifying difficulties in cognitive communication after TBI (Chapman, 1997). This may highlight that SLPs generally identify discourse and high-level language as being appropriate areas of communication to assess, but in reality, it is not carried out in clinical practice. This dilemma of agreeing but not applying in clinical practice has previously been discussed by other studies looking at assessment use in clinical practice with clinicians that have little or no experience in paediatric TBI (McGrane & Cascella, 2000). This does have implications for best practice and motivating factors in assessment choice, which should be continued to be explored, and what the barriers for implementation are should be identified. If SLPs identify what is best practice in theory but are persuaded not to carry it out, this has significant implications to evidence practice within the profession. This has implications for the validity and reliability of assessments being carried out by clinicians and possibly restricted access to services due to over estimated abilities of the child with a TBI

9.3.3   Summary

In summary, this is the first international study known to the author exploring assessment practices of SLPs working in paediatric DLI. This group of SLPs routinely assessed receptive and expressive language and used the CELF-4 more frequently than any other assessment tool. The SLPs were very satisfied with the

CELF-4; they utilised discourse assessment tools infrequently and were less satisfied with discourse assessments like the RBS (Renfrew, 1991) and ERRNI (Bishop, 2004). Assessments that targeted social communication such as the CCC-2 (Bishop, 2003a) was an assessment which had high satisfaction ratings for identifying strengths and weaknesses and provides additional suggestions for SLPs wanting to expand their repertoire of tools to use in clinical practice. Assessment tools for vocabulary, such as the PPVT (Dunn & Dunn, 1997, 2007), were used frequently, but lower satisfaction ratings were reported for all vocabulary assessments for its usefulness, leading to question why is it used in clinical practice.

SLPs from the different countries favoured tools that were made locally, highlighting the impact marketing may have on assessment choice. Additionally, high-level language was more likely assessed by SLPs with greater years of experience.

Assessment choice did not change greatly if SLPs were to assess a child with a TBI. The CELF-4 (Semel et al., 2003) was reported to be used less often with a TBI compared to its use with paediatric DLI, with a mixture of assessment tools suggested as alternatives, namely single word vocabulary assessments or high level language assessments. Previous experience assessing a child with a TBI decreased the likelihood of a discourse or high level language assessment being conducted suggesting barriers with implementing best practice assessment practices in a real clinical situation.

9.4   Assessment practices of SLPs working in paediatric TBI

Overall, SLPs working in paediatric TBI routinely assessed receptive and expressive language followed by functional communication. However, there was

variability between the SLPs with the frequency functional communication was assessed in clinical practice and this may potentially highlight the difference in assessment approaches in clinical practice. There was also variability in the frequency with which certain areas of communication sensitive to TBI were assessed. These areas included pragmatic skills, word finding skills, high level language and discourse (Ewing-Cobbs & Barnes, 2002; Sullivan & Riccio, 2010).

Discourse was one of the areas least likely to be routinely assessed by SLPs further supporting documentation that there are barriers to discourse assessment when evidence would suggest that it is a method to measure communication sensitive to the cognitive communication difficulties of children who have sustained a TBI (Chapman, 1997).This may suggest that general language abilities are preferred areas of assessment and that there continues to be inconsistencies and variation in clinical practice (Sullivan & Riccio, 2010).

This focus on receptive and expressive language measures is in keeping with the tools they use in clinical practice. SLPs working in paediatric TBI favoured standardised developmental language assessments and the most frequently used assessment was the Clinical Evaluations of Language Fundamentals Fourth Edition (CELF 4; Semel et al., 2003) as was in DLI. It was an assessment where SLPs reported the highest level of satisfaction in the tests ability in identifying strengths and weaknesses in a child's communications skills, as well as assist with goal setting and intervention. This would highlight some contradictions with current literature. In studies that have used the CELF-4 or the earlier edition school-aged children with a TBI have general performed within normal range on subtests (Docking et al., 1999; Liégeois et al., 2013).

Given this consistency across some of the studies using the CELF, many questions are raised about how SLPs in a clinical context are satisfied that the assessment provides information about the child's communication skills. If it does happen in clinical context, why does this assessment rate the highest in satisfaction? Given this dichotomy between clinical practice and research, the importance of how this assessment is used within clinical practice is vital to our understanding of best practice in the field of paediatric TBI. In addition, the high amount of SLPS using this in clinical practice with a much smaller percentage of SLPs using other assessments suggest this is an assessment that is used in isolation from other assessments. Given the variability in language abilities in paediatric TBI, multiple methods or tools should be used (Sullivan & Riccio, 2010; Turkstra & Kennedy, 2005) and current results would suggest this is not the case.

The assessment recommended by the ANCDS (Turkstra et al., 2005b), Test of Language Competence (TLC-E; Wiig & Secord, 1989) was used by only half of the SLPs who participated in the survey and only half of that group used it frequently. Compared to other assessments listed SLPs expressed some dissatisfaction with the TLC-E (Wiig & Secord, 1989) and its ability to identify strengths and weaknesses. This is possibly because the test is designed to assess higher level language and because that is an areas of weakness in TBI it doesn't provide the opportunity to highlight what the school-aged child can do and can't do. But the realisation that it does highlight weaknesses in the child's communication skills, might be the reason why this assessment was rated comparatively higher for goal setting and intervention. However, even though the TLC-E (Wiig & Secord, 1989) was an assessment recommended to use, it continues to be used by only a small group of SLPs working in paediatric TBI and barriers to its implementation should be

reviewed. The Paediatric Test of Brain Injury (Hotz et al., 2010) was only used by a very small percentage of SLPs and has currently not become used internationally in the area of paediatric TBI.

In addition to the CELF-4 , the PPVT (Dunn & Dunn, 1997, 2007) was also a popular assessment and these results would suggest that clinical practice internationally is still very similar to what SLPs responded in 1997 with US study by Frank and colleagues (1997). While some of the tools have not changed, there were promising directions outlined in this study with discourse and pragmatic tools the second most used tools, however, this was less than 20% of the group and would not highlight consistency across practice. Another tool also popular was the Comprehensive Assessment of Spoken Language (CASL;Carrow-Woolfolk, 1999). There was a small percentage of SLPs using the Expression Reception, Recall and Narrative Instrument (ERRNI; Bishop, 2004) and the Renfrew Bus Story (RBS; Renfrew, 1991) in clinical practice, but the majority using the tools infrequently. While SLPs were not as satisfied with the RBS (Renfrew, 1991) in comparison to other assessments, the ERRNI (Bishop, 2004) was rated highly overall by SLPs for its ability to identify strengths and weaknesses as well assist with goal setting and intervention. A direct opposite to SLP working in DLI. Even though the ERRNI (Bishop, 2004) was only used by a small sample of SLPs, it may have promising implications for the use of discourse assessment in clinical practice for the school-aged TBI group.

Overall, SLPS were more satisfied with the assessment tool's ability to characterise strengths and weaknesses in communication than assisting with goal setting and intervention. While this may be contradictive to research about the limitations of standardised developmental language assessments (Ewing-Cobbs &

Barnes, 2002; Sullivan & Riccio, 2010), it does prompt questions about what framework is used in clinical practice for paediatric TBI. The ICF model (World Health Organization, 2001) as discussed in section 1.6 suggests a focus on activities and participation, but the majority of the assessments used would not directly support clinical decision-making around those components. Informal assessments made up a small percentage of assessment practices in this group and while this may be an under representation, it did highlight that observation was the preferred choice of informal assessment and was only one of a few assessment tools which directly looked at function and context. One assessment which was used by few and infrequently, the Children's Communication Checklist 2nd Edition (CCC-2; Bishop, 2003a), was rated highly by SLPs to identify strengths and weaknesses and assist with goal setting. The CCC-2 (Bishop, 2003a) provides information from the perspective of the parent about communication and social skills within familiar contexts and possibly has clinical utility in the school-aged TBI group. However, results would suggest that the model discussed by Owens (2014) which focused on psychometric measures is predominately the approach to clinical practice currently.

Finally, literacy was the least likely area to be assessed in clinical practice by SLPs working in paediatric TBI. Specific standardised tools for literacy were used infrequently and comprised of approximately 10% of tools available for use, but in addition, SLPs were also using informal assessments to examine reading and writing. One tool that SLPs reported high satisfaction towards was the Neale Analysis of Reading Ability (Neale, 1997) for identifying strengths and weaknesses and assisting with goal setting and intervention.

9.4.1 Factors influencing assessment practices in clinical practice

9.4.1.2 Different assessment practices across countries

Overall, there were not many differences between countries. Of note was SLPs from USA/CA reporting to assess discourse more often in clinical practice compared to SLPs in the UK and AUS/NZ. The ASHA (2005) guidelines for cognitive communication were written for adults and children. As these guidelines specify the importance of evaluating discourse there may be a greater awareness of this area of assessment in the USA/CA compared to other countries. Whilst discourse assessment was used more frequently by SLPs in the USA/CA, there were no standardised tools to assess discourse in their top five tools. In contrast, discourse assessment tools were in the top five for SLPs working in AUS/NZ and the UK. This is in keeping with survey results from the USA in the Frank and colleagues study (1997), where discourse tools were not identified in the preferred assessment tools. Whether this is conducted informally will be discussed later in this chapter.

Conversely, SLPs working in UK reported assessing functional communication frequently, and they included in their top five tools the CCC-2 (Bishop, 2003a) which complemented their self- reporting. In addition, in countries such as UK and USA/CA, there was a high prevalence of tools used from the country in which the SLP resided in. This may be the result of exposure to particular tests via workshops and conferences, given that this is a common method for clinicians to update their knowledge (Frank & Barrineau, 1996). Also, the Test of Problem Solving (TOPS; Huisingh et al., 2005) was an assessment that was in the top five tools for SLPs in the AUS/NZ and USA/CA. However, this tool was rated by the SLPs with the least amount of satisfaction in its ability to describe strengths and weaknesses and

assist with goal setting, which may possibly be a reason this tool is only used infrequently.

9.4.1.3   Different assessment practice across clinical settings

Areas of communication assessed were similar for inpatient or community settings. One difference was in the area of word finding, which was an area more likely to be assessed in an inpatient setting. Word finding difficulties are viewed as a specific and common linguistic deficit after TBI (Ewing-Cobbs & Barnes, 2002; Hough, 2008), therefore SLPs may specifically screen for this in an inpatient setting. The Renfrew Action Picture Test (RAPT; Renfrew, 2003) was reportedly used more commonly in an inpatient setting. This tool is quick to administer, which might be a reason for its application in that setting. While the TOPS (Huisingh et al., 2005) was both infrequently used and had overall lower satisfaction ratings, SLPs working in an inpatient setting reported increased satisfaction ratings in relation to this tool, particularly with regard to their goal setting and intervention planning. The TOPS (Huisingh et al., 2005) evaluates six aspects of critical thinking, those being making inferences, sequencing, negative questions, problem solving, predicting, and determining causes. In an inpatient rehabilitation setting, this structure of the test may provide valuable therapy tasks to aid the SLP in designing a therapy program. These results do provide valuable information to the SLP looking to identify potential tools to use in an inpatient setting as opposed to a community one and would also allow the SLP to think more broadly of other tools to use. Popular and frequently used tests such CELF-4 and the PPVT (Dunn & Dunn, 2007) were used as frequently in either setting, suggesting repetitive use, and depending on the time span between testing would impact on the validity and reliability of the assessment

results. As part of best practice, repetitive assessment should identified as something to avoid in clinical practice due to practice effects (Heilbronner et al., 2010). Improvements in performance on retesting should be due to a true change in the individual's ability rather than the result of previous exposure to the same or similar measure.

9.4.1.4   *Different assessment practices across SLP's years of experience*

Surprisingly a discourse assessment, ERRNI (Bishop, 2004) was utilised more frequently by SLPs with less years of experience. As it was published in the last decade, use by newer graduates may be due to its inclusion in speech pathology curricula. The ERRNI (Bishop, 2004) provides scores about content, recall, mean length of utterance and comprehensionand other discourse assessments may not provide this information as comprehensively. This assessment would be worth pursuing in studies of paediatric TBI with future investigations evaluating the clinical utility of this tool as well as validity and reliability for this clinical population.

9.4.2.   Summary

In summary this is the first international study to explore assessment practices of SLPs working in paediatric TBI. This group of SLPs routinely assessed receptive and expressive language, with some variability in the frequency with which they reported assessing functional communication. Consistent with the US study by Frank and colleagues (1997) the CELF and PPVT remain prevalent in clinical practice. The use of the CELF-4 was high and consistent throughout the major English-speaking countries.

The CELF-4 was rated highly on criteria such as, its ability to identify strengths and weaknesses and assist with goal setting, raising questions of how models such as ICF (World Health Organization, 2001) are applied in clinical practice with tools that are predominately word and sentence level tasks, representing an impairment level assessment. Other tools rated highly for both criterion included the ERRNI (Bishop, 2004), CCC-2 (Bishop, 2003a) and the CASL (Carrow-Woolfolk, 1999). Factors influencing clinical practice included country, with use of discourse, and functional communication differing between the SLPs from the various countries. Assessment tools such as the RAPT (Renfrew, 2003) and TOPS (Huisingh et al., 2005) may have more clinical utility in an inpatient setting, but some of the popular tools such as the CELF-4 are possibly being repeated in an inpatient and community setting.

9.5   Clinical Evaluations of Language Fundamentals Fourth Edition (CELF-4)

9.5.1   Tabulation of core language, index scores and supplementary tools

The Clinical Evaluation of Language Fundamentals Fourth Edition (CELF 4; Semel et al., 2003) was the most frequently used standardised assessment by SLPs working in paediatric TBI and DLI. This assessment had the highest rating of satisfaction owing to its ability to highlight strengths and weaknesses in a child's communication skills as well as assist in goal setting and intervention planning.

The core language (CL), receptive language (RL), and expressive language (EL) index scores were the most routinely tabulated index scores by SLPs working in paediatric DLI and TBI. As outlined in Figure 1.4, Chapter 1, SLPs use the CELF-4 to identify whether a language disorder exists and then additional index scores RL and

EL to describe the language disorder. There was variability between SLPs in both paediatric TBI and DLI regarding whether further tabulation of the language content (LC), language structure (LS), and language memory (LM) index score was conducted. SLPs infrequently examined the underlying clinical behaviours of the language disorder, those being the working memory (WM) index score, supplementary tests phonological awareness (PA), word associations (WA), and rapid automatic naming (RAN). Nor were the observational rating scale (ORS) or pragmatic profile (PP) frequently used to evaulate how the disorder affected classroom performance.

There was only one difference in the frequency of tabulation between SLPs working across TBI and DLI, and this was with WA, with SLPs working in TBI more likely to tabulate this supplementary test. The WA test has been a tool used by neuropsychologists' to evaluate cognitive outcomes (Rabin et al., 2005). The authors of the CELF-4 suggest using the WA test when clinicians suspect cognitive difficulties in the child with executive function, working memory, and attention and specify TBI as a clinical group for which it should be used. The authors also suggest that WA provides additional information about vocabulary knowledge.

SLPs working in paediatric TBI are using the WA from the CELF-4 to identify underlying clinical behaviours of the language disorder, which is how this is described in the manual and in Figure 1.4. This is consistent with assessment practices of neuropsychologists (Rabin et al., 2005) who also assess WA. This therefore raises clinical questions about how these results may be interpreted between an SLP and neuropsychologist and how this may inform clinical decision-making and whether there is unnecessary duplication of assessments. Neuropsychologists also examines other cognitive domains such as memory,

attention, processing speed, and working memory (Rabin et al., 2005), which all provide further information regarding the cognitive abilities of the child. The results of this study suggested that WM index score is infrequently administered in clinical practice even though WA is suggested by Semel et al. (2003) to be of benefit in the assessment process for children with WM difficulties. What remains to be found is whether this subtest is tabulated in conjunction with the WM index score or if they examined and interpreted in isolation.

Interestingly, given the increased focus within an assessment on pragmatic skills and participation in everyday context (Owens, 2014), the use of the ORS and PP was low and those supplementary tools were the least likely to be used in clinical practice by SLPs working in TBI. Further understanding of the barriers to its use in clinical practice is necessary. The CELF-4 provides impairment-based measures as well as measures on how language and communciation affects performance outside the clinical context, which has been highlighted as providing additional clinical information for the SLP (Bishop & McDonald, 2009; Massa, Gomes, Tartter, Wolfson, & Halperin, 2008). The results of this study would suggest that SLPs are not currently utilising all aspects of the CELF-4.

General measures of RL and EL, like that presented in the CELF-4, are not sensitive to the communication challenges of a child with a TBI (Ewing-Cobbs & Barnes, 2002; Liégeois et al., 2013; Turkstra, 1999). Furthermore, subtle language difficulties are more appropriate areas to assess (Dennis & Barnes, 1990; Hallet, 1997). The CELF-4 has not yet been validated for use on the paediatric TBI population, and the EL index score has been reviewed, with results suggesting it showed weak construct validity (Turkstra et al., 2005b). With this in mind, it needs to be determined whether measures of CL, RL, and EL should be the most routinely

administered and tabulated scores for paediatric TBI as with the DLI or whether other aspects of the test should be of more benefit given differences in DLI and cognitive communication difficulties after TBI. Evidence currently available would suggest that SLPs are using the CELF-4 the same way it would be used for a school-aged child with a DLI. This has possible implications for such a child with a TBI in terms of access to therapy, resources, and ongoing support if access to these services or resources are reliant on an assessment result that consists of CL, RL, and EL index scores that have been shown not to identify impairment. Further research should be considered utilising other subtests from the CELF-4 besides those comprising CL, RL, and EL.

As demonstrated in the Rolandic epilepsy study by Overvliet et al. (2013), the additional new CELF-4 subtests of semantic processing; that identified areas of weakness in that population could possibly highlight that the tabulation of the LC index   might be appropriate to be utilised in clinical research and highlight their clinical utility with the paediatric TBI population. Similarly, the ORS and PP supplementary tests should be utilised in clinical research as they assist with providing clinical assessment recommendations that reflect evidence-based practice. The LC index score is designed to measure semantic development and interpretation of factual and inferential information (Semel et al., 2003), areas of language and cognitive communication that have been highlighted as areas of weakness (Ewing-Cobbs & Barnes, 2002; Hallet, 1997; Sullivan & Riccio, 2010). Nonetheless, considering the CELF-4 is routinely used in clinical practice, the results suggest that some SLPs are not examining these areas of weakness.

Finally, even though the SLP has a role in assessing phonemic awareness skills in clinical practice for school-aged children with a DLI, the majority of SLPs

surveyed infrequently used the PA supplementary test. This may highlight that the use of the PA measure is not favoured in preference for other aspects of the CELF-4 in clinical practice.

9.5.2 Factors influencing CELF-4 use in clinical practice

Factors such as the country the SLP resided in highlighted differences in what aspects of the CELF-4 were administered or tabulated for paediatric DLI. SLPs from the USA/CA were more likely to tabulate a variety other subtests/supplementary tests from the CELF-4. The most popular after the CL, RL, and EL index scores were the LC and LS, which were in turn followed by WM and WA. In comparison, SLPs from AUS/NZ and the UK routinely used the CL, RL, and EL with only a small minority of SLPs tabulating other components of the CELF-4. These results were similar to those of SLPs working in paediatric TBI. SLPs working in paediatric TBI from AUS/NZ presented with a preference for just the CL, RL, and EL index scores, which are aspects of the CELF-4 that would not be sensitive to cognitive-communication changes in a child after a TBI. This has significant implications for clinical practice considering that previous results of this study highlighted that SLPs working in paediatric TBI and DLI from AUS/NZ tended to use the CELF-4 as an isolated assessment tool.

The results of this study highlight some clinical implications that require further exploration. SLPs from the USA/CA working in DLI were more likely to work in a metropolitan setting whereas SLPs from AUS/NZ were more likely to work in rural and remote settings. With this in mind, results may also have implications for service delivery and assessment practices of SLPs working in rural and regional areas. The way the CELF-4 is used may not simply be a reflection of different clinical

assessment practices in one country but rather differences in service delivery for children receiving SLP services in rural/regional versus metropolitan centres.

There were also differences between the SLP's years of clinical experience in DLI and what was tabulated from the CELF-4. SLPs with more years of clinical experience were more likely to tabulate the additional index scores and supplementary tests. This implies that SLPs conducted further evaluation of the underlying clinical behaviours and effects on classroom performance for a school-aged child with a DLI. However, this additional use of the CELF -4 was still less than a third of the group sampled. More importantly, it highlighted that very few SLPs who are new in their SLP career routinely use other aspects of the CELF-4 tool. Whether the SLPs use other tools or informal assessments to identify difficulties in social communication requires further exploration.

Finally, for SLPs working in paediatric TBI, the CELF-4 was similarly used as an assessment tool for both inpatient and community settings. If the ORS or PP was to be used, it was more likely to be used in a community setting, which is reflective of what the tools are designed to be used for, such as participation within the school classroom. This is reported to be a main focus when a child transitions back to school (Galvin et al., 2010). The use of the CELF-4 as a communication tool used in the inpatient and community setting has implications for validity and reliability of the test, particuarly if repeated within a short time span.

SLPs working in DLI reported an increase in the frequency of tabulation of the WM index score, WA supplementary test, and the PP and ORS when assessing a child with a TBI. These results may suggest that, from a theoretical perspective, SLPs identify the CELF-4 as having additional measures that may be appropriate for the paediatric TBI population. Nevertheless, there may be barriers in administering

and tabulating these additional subtests in clinical practice. Possible barriers could be the limited availability of time for the SLP to complete the whole test, or the distractibility of the child with TBI may prohibit such additional testing. Additionally, the barrier may be how these additional results assist with goal setting or intervention. Further study understanding these barriers is warranted.

9.5.3   CELF-4 subtest complexity and impact of working memory

9.5.3.1   CELF-4 subtest complexity

SLPs working in paediatric TBI and DLI agreed that the most complex or difficult subtests in the CELF-4 were formulating sentences (FS), understanding spoken paragraphs (USP), and concepts and directions (C&D). The only point of difference was that the recalling sentences (RS) subtest was rated more difficult by SLPs in DLI than TBI. This is in keeping with research by Ewing-Cobbs and Barnes (2002), who highlighted that children with a TBI perform well on RS tasks, something that SLPs perhaps identify in clinical practice. Moreover, most of the subtests identified as difficult or complex comprised the LC index score, which has implications such as it perhaps being a group of subtests that may evaluate higher-level language skills. It could potentially also be used with the TBI population. Conversely, the WM subtests were rated as the easiest, a possible reason why SLPs do not routinely administer this component of the CELF-4.

9.5.3.2   Impacting of working memory on CELF-4 subtests

Once again, there was agreement between SLPs working in TBI and DLI concerning the degree to which WM impacted on the complexity of the subtests. RS, USP, and C&D were rated as tasks with the the highest amount of WM. RS has

been described as a WM test (Montgomery et al., 2010), but has more recently been

questioned as to whether it is a good representation of WM ability (Okura &

Lonsdale, 2012). The results of this study highlighted possible differences between

SLPs on what WM is and how WM may be represented in a task. Particularly with

SLPs working in TBI, the WM subtest familiar sequences was rated considerably

lower in WM involvement compared to other subtests, with some SLPs feeling there

was either little or no WM impact on this subtest. Variability in SLPs' understanding

or agreement to the level of WM involvement in subtests on the CELF has been

highlighted in the CELF-3 (Turkstra, 1999). Although WM and its impact on language

processing may be an area that is not completely understood or agreed upon with

SLPs, it does have clinical implications. It has been suggested that the greater the

complexity of language, the greater the impact of working memory and the more

likely the person with TBI may have difficulty in performing the task (Moran & Gillon,

2004; Moran, Nippold, & Gillon, 2006). The SLPs from this study identified the EL

index score to have subtests with lower or limited impact of WM, bar the RS,

providing further evidence that the EL may not be an appropriate aspect of the

CELF-4 to use in clinical practice with paediatric TBI.

9.5.4   SLP perceptions and attitudes towards the CELF-4 in clinical practice

SLPs agreed that the CELF-4 was not the only assessment that could be

used in clinical practice to asses RL and EL. Despite its popularity, SLPs felt that it

did not reflect performance outside the clinical setting, nor did it assess functional

abilities. This may be a barrier to the use of the ORS/PP and whether SLPs identify

that these additional supplementary tools correctly assist in detecting some of the

functional abilities of the child outside the clinical setting. A possible driving force in the use of the CELF-4 in clinical practice was that both groups of SLPs agreed that the tool was evidenced based. Despite the fact the CELF-4 has not been rigorously tested to show how reliably it can be used with paediatric TBI, this group of SLPs agreed it had sufficient evidence of its reliability. This possibly provides further support about the limited understanding and recognition of statistical properties for a test and basis for test selection (Huang et al., 1997). SLPs working in paediatric TBI may not even realise that the CELF-4 is not normed or evaluated for use with the TBI population. Nonetheless, variability in response to the test's ability to accurately assess EL perhaps implies that SLPs do recognise its weaknesses as well as supports the recommendation that it lacks construct validity (Turkstra et al., 2005b). Additionally, SLPs working in TBI and DLI both strongly agreed that they would interpret a child's performance based on individual subtests rather than an index score. This is neither suggested in the manual (Semel et al., 2003) nor recommended as best practice in the use of standardised assessments (Crowe, 2010; Hunsley & Mash, 2011). As such, it has significant implications for evidence-based clinical practice and recommendations about how the CELF-4 should be used.

9.5.5   Summary

This is the first study to evaluate how SLPs use the CELF-4 in clinical practice. SLPs working in paediatric TBI and DLI routinely tabulate the CL, RL, and EL index score along with other aspects utilised with varying frequency. The only difference in the use of the CELF-4 between the two groups of SLPs was with the increased use of the WA supplementary tool with SLPs working in paediatric TBI.

There were differences in how the CELF-4 was used to assess paediatric DLI between countries. SLPs from the USA/CA used a variety of the additional index or supplementary tools in clinical practice whereas SLPs from AUS/NZ used key CL, RL, and EL index score only. SLPs with more years of clinical experience reported tabulating additional aspects besides the CL, RL, and EL index score. While there were no statistical differences between SLPs working in TBI, a similar trend of use between countries as in DLI was noted. Additionally, the CELF-4 was shown to be used in a similar manner both in inpatient and community settings in TBI.

SLPs agreed on which subtests had the highest level of complexity. One difference concerned the RS subtest, rated higher in DLI compared with TBI. SLPs from both groups agreed that RS had a high level of WM impacting on the subtest, and additional results highlighted inconsistencies in SLPs' understanding of the impact of WM on a language task. Finally, SLPs agreed the CELF-4 did not assist in showing a child's functional abilities. SLPs working in paediatric TBI reported the test was evidence based, and both groups of SLPs would interpret a child's performance on individual subtests.

The CELF-4 has now expanded with additional subtests and questionnaires to provide an overall picture of the child's communication ability on standardised tests and in real life activities. Specific subtests possibly tap into more subtle aspects of language processing, such as subtests making up the language content index score. These new additions may assist the SLP to understand the cognitive communication needs of the child with a TBI and possibly altered testing practices, such as assessment of language content and not the core language, expressive language and receptive language index scores. This would be a different approach

to the normal process of using the CELF-4 and would require further research to validate this altered practice.

9.6   Discourse Assessment

9.6.1   Formal and informal approaches to discourse assessment

An informal discourse assessment, which consisted of a general observation in the absence of data analysis, was the most frequent way of conducting a discourse assessment in clncal practice. This was consistent with previous research that showed SLPs working in adult TBI (Frank & Barrineau, 1996), paediatric TBI (Frank et al., 1997), and DLI (Caesar & Kohler, 2009; Westerveld & Claessen, 2014) reported conducting an observation as the preferred method of discourse assessment. The use of an informal discourse assessment was conducted more frequently by SLPs working in adult TBI whilst SLPs working in paediatric DLI were the group least likely to conduct an informal discourse assessment. School-aged DLI has previously been identified as an age group where discourse assessment is less likely to be conducted by SLPs (Caesar & Kohler, 2009). The reasons why discourse assessment is a barrier in clncal practice need to be addressed in order to support EBP.

The results of this study suggest that some of the issues raised by researchers previously about the time it takes to transcribe discourse (Coelho, 2007) is still a deterrent to discourse assessment and conducting data analysis. The use of a formal discourse assessment where data analysis did take place was utilised infrequently by SLPs across the three clinical groups. However, when a formal disocurse assessment was conducted, it was more likely to be conducted by the SLPs working in paediatric TBI, but this was a small sample of that group. The

importance of discourse assessment in paediatric TBI has been previously addressed due to the lack of standardised assessments available (Hay & Moran, 2005), and these results support that evidence-based practice is being applied within clinical practice if only for a small group of clinicians.

9.6.2   Genres used to assess discourse

The type of tasks used to elicit discourse can impact the assessment results (Coelho, 2007; Coelho et al., 2005b). In this study, the genre or tasks routinely used to assess discourse comprised a conversation between the clinician and client. This approach did not differ between the SLPs regardless of whether it was with adults with a TBI or school-aged children with a TBI or DLI. This type of task to elicit discourse has its limitations and has been described as similar to an interview rather than conversational dialogue (Togher et al., 1999). The effect of hierarchical power between a clinician and patient or child needs to be considered and the interpretation of results cautioned (Damico & Ball, 2008). It is possible this task is chosen based on ease rather than EBP given time constraints in the assessment (Coelho, 2007). Therefore the SLP needs to be aware of the level of input they are providing in the conversation. This particular approach may rely on the SLP's confidence and knowledge of discourse abilities and their clinical skills and opinions in distinguishing normal from impaired communication. In the assessment of school-aged children, the reliance of a tasks between adult and child may be problematic given the imbalance of power in the interaction (Damico & Ball, 2008). This type of discourse assessment results might not translate to a classroom or peer context unless the correct task in the conversation was elicited (Van Leer & Turkstra, 1999). In addition, given that conversations can be markedly different depending on who is involved in

the interaction (Togher et al., 1999), in which there can be such variation in normal and impaired conversational dialogue (Body & Perkins, 1998), it can be difficult for the SLP to form their clinical decision about the nature of the communication disorder.

The use of additional communication partners to measure discourse was routinely used only by a small sample of the group, more so by SLPs working in paediatric TBI. SLPs working in adult TBI were more likely to use a variety of tasks such as narrative, description, and procedure, which complements research that multiple contexts and tasks need to be considered in evaluating discourse (Coelho et al., 2005b; Togher, 2001). Whilst multiple contexts and genres have also been suggested for use in paediatrics (Owens, 2014), SLPs working in paediatric TBI and DLI did not show that multiple genres were being assessed. Additionally, narrative has been suggested as an appropriate task in paediatrics for evaluating language and cognitive communication skills (Chapman et al., 1992; Gillam et al., 1999), but was routinely used by less than a quarter of the SLPs surveyed. Furthermore, the use of a conversational task may not link well with the school curriculum with the school age group. In this age group children are starting to learn various different discourse genres (Nippold, 2007), which could be assessed by the SLP and then intervention could be applied within the context of the curriculum, but the results do not highlight that this might be taking place.

The evaluation of pragmatics as part of a discourse assessment was more frequently conducted by SLPs in adult TBI, which reflects the framework suggested by Body and Perkins (2006) highlighting the relationship between pragmatic skills and the context or communication environment. Conversely, SLPs working in paediatric TBI and DLI focused less on pragmatic skills in discourse assessment,

which is in keeping with research in this age group that has focused more on oral language measures (Chapman, 1997; Scott & Windsor, 2000).

9.6.3   Factors influencing discourse assessment in clinical practice

Factors such as country, setting of care, and years of clinical experience had minimal impact on the type of discourse assessment and the genres used. These factors mainly influenced SLPs working in adult TBI, with the assessment of pragmatic skills or a narrative more likely to be completed by SLPs with more years of experience. These factors may further demonstrate that SLPs do not feel adequately prepared to assess TBI (Frank & Barrineau, 1996), and clinical skills such as discourse assessment are learnt through experience in the area or from supervision from experienced clinicians (Ylvisaker et al., 2002). Ongoing education and training should be provided, particularly in the early years of their SLP career, on discourse approaches and practices.

9.6.4   SLP perceptions and attitude towards discourse in clinical practice

SLPs working in adult TBI, paediatric TBI, and DLI all agreed to some extent that discourse assessment was important in clinical practice but would not conduct a discourse assessment as their first assessment choice. This is not to say that the SLPs would not conduct a discourse assessment but this may possibly be their second or third choice in the battery of assessments. SLPs working in paediatric DLI were the group least likely to agree about the importance of conducting a discourse assessment. There were also lower levels of agreement by SLPs working in DLI towards their understanding of discourse . This is important information to

understanding the barriers to EBP; if SLPs do not understand what discourse is or what the benefits are, then discourse assessment will continue to be a barrier and will be rarely used in clinical practice. In addition, there was variability in agreement that discourse did change the management of the client. Such results may highlight some difficulties translating findings into a therapeutic context, which has been previously noted as a barrier in discourse assessment in TBI (Coelho, 2007). However, the results may also be applied generally for SLPs regardless of the clinical group they work in.

Further barriers to discourse assessment included responses from SLPs that families, schools, or work places were not interested in discourse results. Similarly, a high percentage of SLPs were not aware of discourse assessments available to them, which may also be a reason why a conversation between clinician and client was used. Surprisingly, not all SLPs felt that analysis of discourse assessment results was time consuming, but there were mixed responses about the SLP's knowledge of what to analyse in a discourse assessment.

These results suggest that there are barriers towards the implementation of discourse assessment based on the SLP's knowledge of discourse, and less around the application of discourse assessment in clinical practice. Results such as these assist the profession in identifying strategies for reducing the barriers. In comparison to SLPs working in adult TBI, SLPs working in paediatric TBI or DLI reported disagreeing to positive statements regarding discourse assessment, possibly highlighting SLPs working in paediatrics identifying greater barriers to discourse assessment. These results may also suggest that the complexity of discourse assessment is different between adults and children. As highlighted by Owens (2014), a clinician will learn to develop skills with repeated practice in assessment to

identifying behaviours in normal and impaired communication in children. These reflections in clinical practice may be quite pertinent to discourse assessment. However, this skill development may be compromised by the task, such as a conversation, which is a task that cannot be standardised. Furthermore, the school-aged group is one example where skills continue to evolve, which constrasts with the established communication skills of adults (Lees, 2005), allowing for a possible baseline of clinical expectations and a performance to compare with. This should all be considered, and particularly concerning paediatric TBI and DLI, education and continued training in the area of discourse management is warranted.

9.6.5   Summary

This is the first international survey of discourse assessment practices with SLPs working across three clinical groups. Results highlighted that discourse assessment was conducted informally, as an observation with no data analysis, by using a conversation between the clinician and client as the task. This raised clinical questions around EBP in terms of the approach to discourse with the possible choice of task mirroring an interview rather than a conversation and what influence a clinician as the communication partner has on the integrity of the assessment results.

SLPs working in adult TBI were most likely to conduct an informal discourse assessment whereas SLPs working in paediatric DLI were less likely to conduct any. SLPs working in adult TBI were more likely to use a variety of genres as tasks compared to those in paediatric TBI and DLI, which exposes some possible dilemmas in assessing developing discourse in children. There was also less focus on pragmatic skills in this area compared with SLPs working in adult TBI.

Barriers to the assessment of discourse highlighted knowledge rather than the application of a discourse assessment as a barrier. Issues raised were around the degree of disagreement towards the importance of discourse assessment, change in management of the adult or child if a discourse assessment is completed, lack of knowledge of assessments available, and the decreased interest from school or family members about discourse assessment results. Greater acknowledgement of barriers was reported by SLPs working in paediatrics, particularly in DLI.

9. 7   Conclusion and future directions

9.7.1   Summary and outcomes of study

This is the first study to identify, describe, and compare the international clinical assessment practices of SLPs working in adult TBI and paediatric TBI and DLI. It highlighted similarities and differences in the approaches to a clinical assessment of SLPs working within these three clinical groups.

SLPs working in adult TBI were found to have a different clinical approach to assessment practices than SLPs in paediatric TBI and DLI. SLPs working in adult TBI reportedly conducted a more comprehensive assessment and assessed a variety of areas of communication more often. Areas of communication routinely assessed by SLPs across the three clinical groups mainly included measures of receptive and expressive language. SLPs working in adult TBI reportedly assessed functional communication routinely within clinical practice compared to those working in paediatric TBI and DLI, which gave less focus to functional communication

Areas of communication that had a similar focus in both adult and paediatric TBI included high-level language pragmatic skills and problem-solving skills. These areas of communication are sensitive to the effects of a TBI (Hallet, 1997; Hough,

2008; Sullivan & Riccio, 2010). However, they were not assessed as part of routine clinical practice for everyone who specialised in the area of TBI. An area of communication with a similar focus for SLPs working in paediatric TBI and DLI was receptive vocabulary.

The tools used in clinical practice were similar in that SLPs working in adult TBI equally favoured aphasia assessments along with cognitive communication and high-level language tools for use in clinical practice. The use of word and sentence-level tasks in aphasia assessments within adult TBI was similar in the use of word and sentence-level tasks in development language assessments employed by SLP working in paediatric TBI and DLI. The use of high-level language and cognitive communication tools was used considerably less by SLPs working in paediatric TBI and DLI than in adult TBI.

The specific tools used in clinical practice did not change between paediatric TBI and DLI, with the CELF-4 (Semel et al., 2003) frequently used by a large sample of the SLPs in this study. This confirms the tool's international popularity whereas previous research had only shown its popularity within the USA (Caesar & Kohler, 2009; Frank et al., 1997; Huang et al., 1997). It also highlighted that the tools used did not change across paediatric TBI and DLI and that satisfaction ratings for the test's ability to identify strengths and weaknesses in communication as well as to assist with goal setting and intervention planning were high.

Amongst SLPs working in paediatric TBI and DLI, there were some discrepancies between the use of discourse and pragmatic tools. Some SLPs working in paediatric TBI favoured the use of the Expression, Reception, and Recall of Narrative Instrument (ERRNI; Bishop, 2004) in clinical practice whereas SLPs working in DLI rated it comparatively lower. This decreased level of satisfaction

towards discourse assessments was consistent with SLPs working in paediatric DLI. One assessment to look at pragmatic skills and functional communication was the Children's Communication Checklist Second Edition (CCC-2; Bishop, 2003a), which was an assessment used by a small percentage in both groups even though it received high satisfaction ratings both for identifying strengths and weaknesses in communication skills and providing assistance in goal setting and intervention. These results suggest that this test has the potential for clinical utility across both DLI and TBI and should therefore be explored further in clinical research.

SLPs working in paediatric TBI and DLI used the CELF-4 (Semel et al., 2003) in a similar manner. They preferred it for tabulating the core language index and identifying whether a language disorder existed as well as then to tabulate the receptive language and expressive language index score to describe the communication disorder. SLPs working in paediatric TBI were additionally more likely to tabulate the word association supplementary test, which measures verbal fluency, something also done by neuropsychologists (Rabin et al., 2005) and which is suggested by Semel et al. (2003) to be used with children who potentially have difficulties with working memory and executive function. However, other aspects of the CELF-4 (Semel et al., 2003) that measured semantic organisation skills, comprehension of discourse, and inferential information, such as the subtests from the language content index score, were not assessed as routinely. These areas of communication are potential language and cognitive communication difficulties in paediatric TBI (Ewing-Cobbs & Barnes, 2002) and could potentially highlight a gap in assessment practices when using the CELF-4 (Semel et al., 2003) for the paediatric TBI population. Additionally, the minimal use of the observational rating scale and pragmatic profile further support the concept that SLPs working in paediatric TBI and

DLI do focus on impairment measures using a formal traditional approach with psychometric measures to inform clinical decision-making.

The use of discourse assessment was more likely conducted in an informal manner using observation and no data analysis to inform clinical decision-making. This was similar across SLPs working in the three clinical groups. The preferred method of measuring discourse was a conversation between the clinician and the client, which raises clinical questions about whether this approach to discourse assessment is evidence based and should be encouraged in clinical practice. SLPs working in adult TBI were more likely to use a variety of genres to assess discourse and were more likely to include pragmatic skills within their clinical assessment of discourse. Formal discourse assessment was conducted by a small percentage of SLPs. This was even less so in paediatric DLI. However, if a formal discourse assessment were to be conducted, it would more likely be done in paediatric TBI. Results would suggest that the ERRNI (Bishop, 2004) is the preferred discourse tool in paediatric TBI.

Factors such as country, setting of care, and years of clinical experience did have some impact on clinical assessment practices. The use of cognitive assessments in clinical practice was identified in adult TBI with SLPs residing in the USA/CA. This complemented the framework and approach to the assessment of cognitive communication disorders by Body and Perkins (2006). This result was also in keeping with clinical guidelines outlined by American Speech-Language-Hearing Association (2005), which identifies the role of the SLP to assess cognition as part of a clinical assessment. SLPs from countries where there were no specific guidelines did not use cognitive assessment as part of clinical practice. In addition, the tools used in clinical practice by SLPs across the three clinical groups highlighted a

preference for tools developed and published within their country. This possibly highlights that marketing may impact on the assessment tools used in clinical practice. Years of clinical experience also impacted on clinical practice, with SLPs with more years of experience more likely to conduct an assessment of high-level language and problem solving ability as part of routine clinical practice in adult TBI and paediatric DLI. Finally the clinical setting had minimal impact on the clinical assessment, but in adult and paediatric TBI, the use of discourse and pragmatic tools were more likely used in a community setting.

9.7.2   Clinical implications and further research

The study has highlighted a number of areas that have clinical implications for SLPs working in adult TBI and paediatric TBI and DLI. A number of implications and areas of future research have been highlighted throughout Chapter 9, and some of the key points will be discussed below.

Commonly used clinical tools across the three groups raise questions regarding the use of best practice, given our current knowledge of the complexities of communication disorders following TBI and DLI. Assessment tools such as the Mount Wilga High Level Language Assessment (Christie et al., 1986) have neither normative data nor psychometric properties, and a variety of aphasia assessments used in adult TBI may not be senstive to the complex cognitive communication evidenced by this population. Similarly, the frequent use of the CELF-4 (Semel et al., 2003) in paediatric TBI in the absence of other assessments, which encompass communication activities and participation, is an issue requiring further investigation. Additionally, clinical research is needed to justify the clinical utility, validity, and reliability of these tests in clinical practice and which combination of tests provides the best diagnostic accuracy for each clinical group. Clinical guidelines in the area of

cognitive communication in adult TBI have broadened the role of SLPs to incorporate cognition as part of a clinical assessment. The impact a clinical guideline can have on SLP practice was demonstrated by the SLPs conducting an assessment of cognition in the USA/CA. Therefore, to ensure consistency across associations, guidelines for use in AUS/NZ and the UK is recommended, thereby bridging the gap between assessment practices. Given the overlap in roles between neuropsychologists and SLPs in the assessment of cognition (Sander et al., 2009; Wertheimer et al., 2008), careful description and advice around this role should be provided so that assessments are not duplicated and that there be no unnecessary waste of resources. Recent review of guidelines for aphasia rehabilitation (Rohde, Worrall, & Le Dorze, 2013) and a recent international guideline published by Togher et al (2014) presented a set of seven recommendations for the assessment and treatment of cognitive communication disorders following adult TBI. The aim of these endeavours is to ensure consistency of expected best practice between international agencies and to promote interdisciplinary approaches to assessment.

The tools utilised by SLPs working in adult TBI highlighted frameworks such as the model of cognitive communication by Body and Perkins (2006) as well as the World Health Organization (2001) International Classification of Functioning, Disability and Health Model of Functioning and Disability. The use of such frameworks was not as obvious in the tools used by SLPs working in paediatric TBI and DLI, with a predominance of formal, traditional approaches using psychometric measures utilised. Further research is needed to identify assessment tools and processes that allow the SLP to make informed clinical decisions about language and cognitive communication and its impact within a real-life context. The assessment tool CCC-2 (Bishop, 2003a) may potentially assist SLPs bridge this gap,

so further clinical research into the use of this tool with both paediatric TBI and DLI should be encouraged.

Given that school-aged children with a TBI are more likely to experience subtle language difficulties (Hallet, 1997; Sullivan & Riccio, 2010), clinical research should examine appropriate and sensitive standardised assessment tools for this clinical population. The level of satisfaction with the ERRNI (Bishop, 2004) suggests a possible area for future clinical research. Additionally, if the CELF-4 (Semel et al., 2003) continues to be used as the most popular and frequently used assessment tool in paediatric TBI, further research is needed to compare children with a TBI and DLI to highlight their differences in clinical presentation on the assessment tool. The tools use should be broadened beyond the CL, RL, and EL index scores. Moreover, further education and training about extension testing and identifying children with higher-level language difficulties should be implemented, particularly for SLPs who are establishing their career in speech pathology or who work in isolation in regional and rural areas without the support of an experienced mentor.

Discourse assessment continues to be used rarely in clinical practice due to problems concerning knowledge of assessments to use, analysis methods, and clinical application of the findings. These barriers are more prevalent in paediatric DLI, and steps to address why this is the case should be considered. Education about tools available is one aspect, but possibly broader issues around service delivery may need to be considered given that SLPs felt schools were not interested in discourse results. Current evidence-based practice could be improved by standardising discourse tasks used by the SLPs across the three clinical groups. Guidelines, education, and strategies around implementation need to be considered and adapted for each clinical group in order to identify how best practice is applied.

9.7.3   Limitations

The present study was subject to some limitations. One potential limitation of this study is the potential sample bias, in that SLP survey participants were recruited based on their own perception of identification using previous experience with populations/patients with adult TBI, paediatric TBI, and paediatric DLI. SLPs were asked if they had specialist experience and skills working with any of those three clinical groups. The extent to which they may have assessed a client with TBI or DLI, or the frequency of assessment, were questions not explicitly asked. It is therefore possible that SLPs with minimal or extremely limited experience in TBI or DLI may have participated in the survey. This risk was mitigated by recruiting through speech pathology interest groups in brain injury in the sample countries as well as managers of Speech Pathology departments throughout a number of hospitals and community health centres, as discussed in Chapter 2.

An additional limitation is that there are also potential weaknesses in using Likert scales. This is due to their subjective nature of evaluation and that evidence suggests that the culture or country of the respondent may result in a question on a Likert scale being answered more or less positively (Lee, Jones, Mineyama, & Zhang, 2002). To manage this possible weakness, the use of Likert scales was supplemented with open-ended questions, thereby offering participants the opportunity to provide detail about their current clinical practice.

Categorising assessments into groups is not always a simple process. An assessment can have multiple subtests that may overlap into other categories, or there may different perspectives of where an assessment might be best categorised. This has been highlighted in previous research that has attempted to map assessments to the ICF model (Hughes & Orange, 2007). Nonetheless, this potential

problem was addressed by obtaining agreement from a panel of five experienced researchers in the field of TBI and DLI who assisted in assigning different assessment tools to the categories outlined in the methodology of Chapter 2.

The sample size of SLPs working in paediatric TBI was considerably smaller than the group of SLPs working in paediatric TBI and DLI. However, it was acknowledged that this particular sub-specialty in SLP would be smaller given the more highly specialised area that paediatric TBI is and that SLPs with specialist skills in this area would more likely be attached to hospitals. Recruitment of SLPs was therefore targeted to increase the sample size. It needs not be acknowledged that greater statistical power may have occurred were there a larger sample size.

The use of informal assessment procedures may have been underestimated in this study. While in previous studies where SLPs identified assessment practices, a choice of different informal procedures was provided in this study to identify those used in clinical practice (Caesar & Kohler, 2009; Frank & Barrineau, 1996; Frank et al., 1997). It was considered that this may bias SLPs' responses, so in this study open-ended questions were used. Although SLPs recruited in the sampling of the survey did not misinterpret questions to be based only on standardised assessment tools, it is always possible that SLPs may have interpreted this as only formal standardised assessment procedures. Additionally, in the analysis of approaches to discourse assessment and the tasks used, the definition of discourse used did not specifically indicate spoken language. Some SLPs may have spoken about practice for spoken and written discourse. Given the results, it is unlikely that this occurred with the majority of clinicians using conversation to assess discourse, but it is possible they were commenting on both tasks used to assess spoken and written and approaches may be different for those two modalities.

9.7.4 Conclusion

This study has provided a greater understanding of the assessment practices of SLPs working in adult TBI and paediatric TBI and DLI. It has valuable implications for the identification of barriers to translating evidence-based practice into the clinical context and has highlighted some of the strengths in assessment practices across different countries and different clinical groups. The hope is that this study will provide significant contributions to the SLP's approach to clinical assessment and that the SLP who works alongside adults and children with acquired or developmental communication disorders will have a broader understanding of their role in the choice, administering, and analysis of a clinical assessment with their client population.

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Appendix A - CELF-4 Subtest Description

Subtest	Test Description	Age Groups			
		5-8 Years	9 years	10-12 years	13-21 years
Concepts & Directions	Following directions of increasing length and complexity	■	■	■	
Recalling Sentences	Repeating sentences of varying length and complexity	■	■	■	■
Formulating Sentences	Constructing a sentence using a given word about a picture	■	■	■	■
Word Structure	Using morphological rules in a sentence completion task	■			
Sentence Structure	Following a direction from a sentence using different grammatical structure	■			
Word Classes – Receptive	Comprehending a relationship from given words (pictures for 5-7) and verbally presented for >7yrs	■	■	■	■
Word Classes – Expressive	Verbally explaining the relationship between given words (pictures for 5-7) and verbally presented for >7yrs		■	■	■
Word Classes – Total	Combination of the WC-R and WC-E score		■	■	■
Expressive Vocabulary	Naming task from a picture	■			
Word Definitions	Defining a word provided in a sentence			■	■
Understanding Spoken Paragraphs	Comprehending varying questions from a story read to child		■	■	■
Sentence Assembly	Unjumbling words to create two different sentences			■	■
Semantic Relationships	Comprehending a relationship from sentences verbally presented			■	■
Numbers Repetition – Forward	Verbally repeating digits in the exact order presented		■	■	■
Numbers Repetition – Backward	Verbally repeating digits in the reverse order presented		■	■	■
Familiar Sequences 1/2	**Reciting common information quickly**		■	■	■

Appendix B - CELF-4 Index Score and Supplementary Test Description

Index Scores	Test Description	Age Groups			
		5-8 Years	9 years	10-12 years	13 -21 years
Core Language	Measures general language ability and is used to make a decision about the presence of a language disorder	■	■	■	■
Receptive Language	A measure of listening and auditory comprehension	■	■	■	■
Expressive Language	Measure of verbal language skills	■	■	■	■
Language Structure	Measures comprehension and production of syntactic structures	■			
Language Content	Measures semantic development including vocabulary and inferential comprehension	■	■	■	■
Language Memory	Ability to apply working memory to content and structure	■			
Working Memory	Measure of attention concentration and recall	■	■	■	■

Supplementary Test	Test Description	Age Groups			
		5-8 Years	9 years	10-12 years	13 -21 years
Phonological Awareness	Measures manipulation of sound structures of language	■	■	■	■
Rapid Automatic Naming	Measures ability to name randomised sequences of colours, shapes, and combinations.	■	■	■	■
Word Fluency	Measures retrieval and naming of words from a semantic category	■	■	■	■
Observational Rating Scale	Measures student's ability to follow teacher's instructions and manage classroom behaviours that may impact on learning	■	■	■	■
Pragmatic Profile	Measures a student's communication skills using real-life contextual information	■	■	■	■

Appendix C - CELF-4 Subtests Calculated to Tabulate the Index Scores for All Age Ranges

Subtest Scaled Score	Index Scores																
	Core Language			Receptive Language			Expressive Language		Language Content				Language Structure[4]	Language Memory[5]		Working Memory	
	Age Groups																
	5-8	9-12	13-21	5-8	9-12	13-21	5-8	9-21	5-8	9	10-12	13-21	5-8	9-12	13-21	5-8	9-21
Concepts & Directions	■	■		■	■				■				■	■			
Word Structure	■	■	■				■						■	■	■		
Recalling Sentences	■	■	■				■	■					■	■	■		
Formulated Sentences	■						■	■									
Word Classes - Receptive				■	■	■											
Word Classes - Expressive								■									
Word Classes - Total		■							■	■	■						
Sentence Structure				■									■	■			
Expressive Vocabulary									■								
Word Definitions		■									■	■					
Understanding Spoken Paragraphs					■						■	■					
Sentence Assembly												■					
Semantic Relationships					■										■		
Numbers Repetition - Total																■	■
Familiar Sequences 1/2																■	■

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[4] Language structure index score is only calculated for the 5-8year age group

[5] Language memory index score is not calculated for the 5-8year age group

Appendix D - Ethics Letter

15 July 2010

HUNTER NEW ENGLAND
NSW⊕HEALTH

Mr Matthew Frith
PO Box 2563
Dangar NSW 2309

Dear Mr Frith,

Re: The efficacy of developmental standardised language assessments for acquired cognitive communication disorders (ACCD) in children following severe traumatic brain injury (TBI) (10/04/21/5.10)

HNEHREC reference number: 10/04/21/5.10
HREC reference number: HREC/10/HNE/75
SSA reference number: SSA/10/HNE/76

Thank you for submitting an application for authorisation of this project. I am pleased to inform you that authorisation has been granted for this study to take place at the following sites:

- **John Hunter Children's Hospital;**
- **Kaleidoscope:**
  - ○ **Hunter Children's Health Network; and**
  - ○ **Community Child & Youth Health Services (Child & Family Health Services and Community Speech Pathology Services)**

The following conditions apply to this research project. These are additional to those conditions imposed by the Human Research Ethics Committee that granted ethical approval:

1. Proposed amendments to the research protocol or conduct of the research which may affect the ethical acceptability of the project, and which are submitted to the lead HREC for review, are copied to the research governance officer;
2. Proposed amendments to the research protocol or conduct of the research which may affect the ongoing site acceptability of the project, are to be submitted to the research governance officer.

Yours faithfully

Dr Nicole Gerrand
Research Governance Officer
Hunter New England Health

13 July 2010

HUNTER NEW ENGLAND
NSW⊕HEALTH

Mr M Frith
PO Box 2563
Dangar NSW 2309

Dear Mr Frith,

Re: The efficacy of developmental standardised language assessments for acquired cognitive communication disorders in children following severe traumatic brain injury (10/04/21/5.10)

HNEHREC Reference No: 10/04/21/5.10
NSW HREC Reference No: HREC/10/HNE/75

Thank you for submitting the above protocol for single ethical review. This project was first considered by the Hunter New England Human Research Ethics Committee at its meeting held on **21 April 2010.** This Human Research Ethics Committee is constituted and operates in accordance with the National Health and Medical Research Council's *National Statement on Ethical Conduct in Human Research (2007)* (National Statement) and the *CPMP/ICH Note for Guidance on Good Clinical Practice.* Further, this Committee has been accredited by the NSW Department of Health as a lead HREC under the model for single ethical and scientific review. The Committee's Terms of Reference are available from the Hunter New England Area Health Service website: http://www.hnehealth.nsw.gov.au/Human_Research_Ethics.

I am pleased to advise that following acceptance under delegated authority of the requested clarifications and revised recruitment documentation, by Dr Nicole Gerrand Manager, Research Ethics & Governance, the Hunter New England Human Research Ethics Committee has granted ethical approval of the above project.

The following documentation has been reviewed and approved by the Hunter New England Human Research Ethics Committee:

- Stage 1:
    - The Draft email invitation to Speech Pathologist to participate in survey (Version 2 dated 1 July 2010);
    - The Draft email Web Link to Speech Pathologist to participate in survey (Version 2 dated 1 July 2010);
    - The Assessment Practices of Speech Language Pathologists Online Survey
- Stage 2:
    - The Participant Information Sheet (Parent/Carers TBI Group) (Version 2 dated 1 July 2010);
    - The Participant Information Sheet (Parent/Carers Language/Learning Difficulties Group) (Version 2 dated 1 July 2010);
    - The Participant Information Sheet (Parent/Carers Control Group) (Version 2 dated 1 July 2010);
    - The Script for Parents of TBI Child – but identify additional son &/or daughter as potential control (Version 1 dated 1 July 2010);

Hunter New England Research Ethics & Governance Unit

(Locked Bag No 1)
(New Lambton NSW 2305)
Telephone (02) 49214 950 Facsimile (02) 49214 818
Email: hnehrec@hnehealth.nsw.gov.au
http://www.hnehealth.nsw.gov.au/Human_Research_Ethics

- ▪ The Participant Information Sheet (Parent/Carers Sibling Control Group) (Version 1 dated 1 July 2010);
- ▪ The School Information Sheet (to be distributed to principals/teachers/school counselors) (Version 1 dated 1 July 2010);
- ▪ The Participant Consent Form (Parent/Carer Control Group) – Master Copy (Version 2 dated 1 July 2010);
- ▪ The Participant Consent Form (Parent/Carer TBI Group) (Version 2 dated 1 July 2010);
- ▪ The Participant Consent Form (Parent/Carer Developmental Language/Learning Group) Recruited through the school (Version 2 dated 1 July 2010);
- ▪ The Participant Consent Form (Parent/Carer Developmental Language/Learning Group) Recruited through the Health Service (Version 2 dated 1 July 2010);
- ▪ The La Trobe Communication Questionnaire;
- ▪ The Children's Communication Checklist (CCC-2);
- ▪ The CCC-2 Summary Sheet;
- ▪ The Behaviour Rating Inventory of Executive Function (BRIEF) Parent Form;
- Stage 3:
  - ▪ The Participant Information Sheet (Patent Carers TBI) (Version 2 dated 1 July 2010);
  - ▪ The Participant Information Sheet (Parent/Carers Developmental Language/Learning Difficulties: Health) (Version 2 dated 1 July 2010);
  - ▪ The Participant Information Sheet (Parent/Carers Developmental Language/learning difficulties: Schools) (Version 2 dated 1 July 2010);
  - ▪ The Participant Information Sheet (Parent/Carers Controls) (Version 2 dated 1 July 2010);
  - ▪ The Participant Information Sheet (TBI Group Young Child 5-10yrs) (Version 2 dated 1 July 2010);
  - ▪ The Participant Information Sheet (Participant DLI Recruited through Health Service (Child 5-10yrs) (Version 2 dated 1 July 2010);
  - ▪ The Participant Information Sheet (Participant DLI Recruited through Schools (Child 5-10yrs) (Version 2 dated 1 July 2010);
  - ▪ The Participant Information Sheet (Control Group Young Child 5-10yrs) (Version 2 dated 1 July 2010);
  - ▪ The Participant Information Sheet (TBI Group Youth 11-15yrs) (Version 2 dated 1 July 2010);
  - ▪ The Participant Information Sheet (TBI Group Youth 11-15yrs) Health Service (Version 2 dated 1 July 2010);
  - ▪ The Participant Information Sheet (Developmental language Group Youth 11-15yrs) School (Version 2 dated 1 July 2010);
  - ▪ The Participant Information Sheet (Control Group Youth 11-15yrs) (Version 2 dated 1 July 2010);
  - ▪ The Participant Information Sheet (TBI Group Young Adults 16-18yrs) (Version 2 dated 1 July 2010);
  - ▪ The Participant Information Sheet (Parent/Carers Developmental language/learning difficulties: Schools) (Version 2 dated 1 July 2010);
  - ▪ The Participant Information Sheet (Control Group Young Adult aged 16-18yrs) (Version 2 dated 1 July 2010);
  - ▪ The Consent Form (Child TBI Group 5-10yrs) (Version 2 dated 1 July 2010);
  - ▪ The Consent Form (Child DLI Group 5-10yrs – Recruited through Health Service) (Version 2 dated 1 July 20100;
  - ▪ The Consent Form (Child DLI Group 5-10yrs – Recruited through schools) (Version 2 dated 1 July 2010);
  - ▪ The Consent Form (Child Control Group) (Version 2 dated 1 July 2010);

Approval has been granted for this study to take place at the following sites:

- **John Hunter Children's Hospital, NSW**
- **Sydney Children's Hospital at Randwick, NSW**
- **Children's Hospital at Westmead, NSW**

Approval from the Hunter New England Human Research Ethics Committee for the above protocol is given for a maximum of **5** years from the date of this letter, after which a renewal application will be required if the protocol has not been completed.

The *National Statement on Ethical Conduct in Human Research (2007)*, which the Committee is obliged to adhere to, include the requirement that the committee monitors the research protocols it has approved. In order for the Committee to fulfil this function, it requires:

- A report of the progress of the above protocol be submitted at 12 monthly intervals. Your review date is **July 2011.** A proforma for the annual report will be sent two weeks prior to the due date.

- A final report must be submitted at the completion of the above protocol, that is, after data analysis has been completed and a final report compiled. A proforma for the final report will be sent two weeks prior to the due date.

- All variations or amendments to this protocol, including amendments to the Information Sheet and Consent Form, must be forwarded to and approved by the Hunter New England Human Research Ethics Committee prior to their implementation.

- The Principal Investigator will immediately report anything which might warrant review of ethical approval of the project in the specified format, including:

  - Any serious or unexpected adverse events
    - Adverse events, however minor, must be recorded as observed by the Investigator or as volunteered by a participant in this protocol. Full details will be documented, whether or not the Investigator or his deputies considers the event to be related to the trial substance or procedure. These do not need to be reported to the Hunter New England Human Research Ethics Committee

    - Serious adverse events that occur during the study or within six months of completion of the trial at your site should be reported to the Manager, Research Ethics & Governance, of the Hunter New England Human Research Ethics Committee as soon as possible and at the latest within 72 hours.

    - All other safety reporting should be in accordance with the NHMRC's Safety Monitoring Position Statement – May 2009 available at http://www.nhmrc.gov.au/health_ethics/hrecs/reference/_files/090609_nhmrc_position_statement.pdf

    - Serious adverse events are defined as:

      - Causing death, life threatening or serious disability.

Hunter New England Research Ethics & Governance Unit

- Cause or prolong hospitalisation.
- Overdoses, cancers, congenital abnormalities whether judged to be caused by the investigational agent or new procedure or not.

- Unforseen events that might affect continued ethical acceptability of the project.

- If for some reason the above protocol does not commence (for example it does not receive funding); is suspended or discontinued, please inform Dr Nicole Gerrand, as soon as possible.

You are reminded that this letter constitutes ethical approval only. You must not commence this research project at a site until separate authorisation from the Chief Executive or delegate of that site has been obtained.

A copy of this letter must be forwarded to all site investigators for submission to the relevant Research Governance Officer.

Should you have any concerns or questions about your research, please contact Dr Gerrand as per her details at the bottom of the page. The Hunter New England Human Research Ethics Committee wishes you every success in your research.

Please quote **10/04/21/5.10** in all correspondence.

The Hunter New England Human Research Ethics Committee wishes you every success in your research.

Yours faithfully

For: Dr M Parsons
       Chair
       Hunter New England Human Research Ethics Committee

Appendix E - Online Survey Questions for SLPs working in

Paediatric TBI or DLI

Matthew Frith
Research Higher Degree Candidate
University of Sydney
Speech Pathologist / Team Leader
Kaleidoscope: Hunter Children's Health Network

PO BOX 2563
DANGAR NSW
AUSTRALIA 2309

(P) +61(0)2 4925 7820
(F) +61(0)2 4925 7955
(E) matthew.frith@hnehealth.nsw.gov.au

Introduction

You are invited to take part in a research study involving the assessment of language and communication skills. This is part of a wider study investigating the assessments measuring language and communication after a traumatic brain injury in childhood.

This study is being conducted by Matthew Frith, Speech Pathologist with Kaleidoscope's Paediatric Brain Injury Rehabilitation Team, Newcastle, NSW, Hunter New England Health.

This study is being conducted as part of Matthew Frith's Research Higher Degree (Speech Pathology) with the University of Sydney under the supervision of Associate Professor Leanne Togher.

If you complete the survey online you are consenting to participate in the study. It is important you read and understand this form. It describes the purpose, benefits and risk of the study as well as your right to withdraw.

Aims of the study

The aims of the study are to:

(a)   Identify the assessments used by clinicians in the area of language and communication with children who have sustained a traumatic brain injury and children with developmental language delays and/or disorders.
(b)   Identify the similarities and differences in assessment procedures of language based communication disorders with children who have acquired language based communication difficulties, compared to children with developmental language based communication disorders and/or delays.

Who is being asked to participate?

Speech Language Pathologists who provide clinical assessment of language based communication disorders only in the following areas are invited to take part in this study:

1.   Children's rehabilitation after Traumatic brain injury (TBI)
2.   Children with developmental language disorders and/or delays. This does not include children with a profound intellectual disability or children who are nonverbal in their communication.

What choice do you have?

Participation in this research survey is entirely voluntary and anonymous. Whether or not you to decide to participate will not affect you or your professional relationships with the health service or university.

What will you be asked to do?

If you agree to participate you will be asked to complete this anonymous survey.

In this survey you will also be asked to:

(a)   Provide information about your clinical expertise
(b)   Complete questions about the school age population and the assessments you use to assess language based communication difficulties
(c)   Complete questions about how you use assessments to assist with goal setting and therapy activities
(d)   Provide information about your use of assessment of discourse in clinical practice

(e)   Complete questions about their use (if applicable) of the Clinical Evaluation of Language Fundamentals Fourth Edition (CELF-4).

Risks

There are no risks associated with participating in this study. If you decide to complete the survey you will not be identified. There are no right or wrong answers and this survey is not about testing speech language pathologists about their clinical knowledge.

The questionnaire should take 10 minutes to complete for clinicians answering questions about adult traumatic brain injury, 20 minutes to complete for clinicians answering questions about paediatric traumatic brain injury and approximately 30 minutes for clinicians answering questions about developmental language impairment.

Benefits

It is possible that by completing these questionnaires you will assist in developing assessment protocols for children with acquired language based communication difficulties after a traumatic brain injury.

How will the information collected be used?

The findings of the research will be submitted in papers in scientific journals and presented at professional conferences. Individual participants will not be identified in any report or presentation. Information will also be used by the Research Higher Degree candidate, Matthew, for the completion of his thesis at the University of Sydney, working under the supervision of Associate Professor Leanne Togher.

What do you need to do to participate?

If you have understood the content of this information sheet please click "next" to start the survey. If there is anything you do not understand, or you have questions please contact:

Matthew Frith – Speech Pathologist Paediatric Brain Injury Rehabilitation Team,
Kaleidoscope Hunter Children's Health Network,
John Hunter Children's Hospital and Children, Young People & Family Services,

Newcastle NSW Australia 2302,
(T) +61(0)2 4925 7820
(E) matthew.frith@hnehealth.nsw.gov.au

Further information

If you would like further information about the project please contact:

Matthew Frith
(T) +61(0)2 4925 7820
(E) matthew.frith@hnehealth.nsw.gov.au.

Complaints about this research

This research has been approved by the Hunter New England Human Research Ethics Committee of Hunter New England Health reference 10/04/21/5/10. Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or if an independent person is preferred, to:

Dr Nicole Gerrand – Manager Research Ethics and Governance,
Hunter New England Human Research Ethics Committee,
Hunter New England Health, Locked Bag No 1,
New Lambton NSW 2305

(T) (02) 4921 4950,
(E) HNEHREC@hnehealth.nsw.gov.au.

Research team

Matthew Frith
Research Higher Degree Candidate

University of Sydney
Speech Pathologist / Team Leader
Kaleidoscope: Hunter Children's Health Network
Paediatric Brain Injury Rehabilitation Team

PO BOX 2563
DANAGAR NSW
AUSTRALIA 2309

(T) +61(0)2 4925 7820
(F) +61(0)2 4925 7955
(E) matthew.frith@hnehealth.nsw.gov.au

Associate Professor Leanne Togher
Principal Supervisor
Senior Research Fellow, National Health and Medical Research Council
Discipline of Speech Pathology
Faculty of Health Sciences, The University of Sydney
SYDNEY, AUSTRALIA

75 East St
PO Box 170, Lidcombe NSW 1825
Faculty of Health Sciences, The University of Sydney
(T) +61(0)2 9351 9639
(F) +61(0)2 9351 9163
(E) leanne.togher@sydney.edu.au

Professor Alison Ferguson
School of Humanities and Social Science
Faculty of Education & Arts

University of Newcastle
Callaghan, NSW
AUSTRALIA 2308
(T) +61(0)2 4921 5716
(F) +61(0)2 4921 7386
(E) alison.ferguson@newcastle.edu.au

Dr. Wayne Levick
Conjoint Associate Professor
University of Newcastle

Senior Clinical Neuropsychologist
Kaleidoscope Hunter Children's Health Network
John Hunter Children's Hospital
Locked Bag No 1
HUNTER REGION MAIL CENTRE, NSW AUSTRALIA 2310
(T) +61(0)2 4921 3752
(F) +61(0)2 4921 3740
(E) wayne.levick@hnehealth.nsw.gov.au

Dr Kimberley M. Docking
Discipline of Speech Pathology
The University of Sydney

PO Box 170
Lidcombe NSW AUSTRALIA 1825

(T) +61(0)2 9351 9694
(F) +61(0)2 9351 9173
(E) kimberley.docking@sydney.edu.au

Demographic Information

Please identify your current geographical location from the list below.
○ Metropolitan
○ Rural
○ Remote

Please complete the following. The answer relates to your work setting. (If you do not wish to complete this section please click "NEXT" and you will be moved on to the next question)
City/Town: _____

ZIP/Postal Code: _____

Country: _____

How long have you been working as a Speech-Language Pathologist?
○ <1year   ○ 4–6years   ○ 11–15years

○ 1–3years   ○ 7–10years   ○ >15years

Clinical Caseload

Please choose from the following options:

Which client group best represents your current clinical experience.
○ Developmental language delays/disorders in children
○ Rehabilitation of acquired language based communication disorders in children following a traumaic brain injury (TBI)

   In which setting do you primarily provide a clinical service?
○ Inpatient Hospital (Acute and/or Rehabilitation)
○ Outpatient / Community Rehabilitation
○ Community Health / Clinic Based Services
○ Preschool / School Based Services
○ University
○ Private Practice
○ Other

Age Group of Caseload

The following questions will ask you about the school age (5-12years) population caseload that you see in your clinic. The age groups include

Please base your answers on the last 12 months of your clinical caseload.

Multiple choice responses are provided with descriptors attached to each value. Some use percentages. Your overall responses do not have to equal 100%.

Questions will ask you about:

(a) The age group you see and the frequency with which you see them
(b) Assessments you use to assess language based communication difficulties for each age group. It will also ask you to rate your satisfaction with the assessment for identifying the client's strength and weaknesses and its usefulness in goal setting and intervention
(c) The use of standardised and non-standardised assessments to formulate goals for your clients

School Age (5-12 Year Age Group)

How often do you provide assessment of language based communication difficulties in the 5-12 year age group?

○ Never (0% of clinical time)
○ Infrequent (<25% of clinical time)
○ Somewhat Frequent (25% <50% of clinical time)
○ Frequently (50% <85% of clinical time)
○ Majority of the Time (>85% of clinical time)

Areas of Assessment for Language Based Communication Disorders (5-12 Year Age Group)

How often would you investigate the following areas of language and communication in your assessment of the 5-12 year age group?

	Never (0% of clinical time)	Infrequent (<25% of clinical time)	Somewhat Frequent (25% <50% of clinical time)	Frequently (50% <85% of clinical time)	Majority of the Time (>85% of clinical time)
Receptive Language	○	○	○	○	○
Expressive Language	○	○	○	○	○
Verbal Pragmatic Skills	○	○	○	○	○
Non Verbal Pragmatic Skills	○	○	○	○	○
Discourse	○	○	○	○	○
Phonemic Awareness / Phonics	○	○	○	○	○
Word finding Skills	○	○	○	○	○
Receptive Vocabulary	○	○	○	○	○
High level Language	○	○	○	○	○
Problem Solving	○	○	○	○	○
Reading Decoding	○	○	○	○	○
Reading Comprehension	○	○	○	○	○
Written Language	○	○	○	○	○
Functional Communication	○	○	○	○	○

Assessments for Language Based Communication Disorders (5-12 Year Age Group)

Below is a list of some language based communication assessments used by Speech Language Pathologists for the 5-12 year age group.

Please state how often you use each assessment. Please leave the box blank if you never use the assessment.

If you have used the assessment please rate how satisfied you are that the assessment you use:

    a)   Identifies the client's strengths and weaknesses in communication

    b)   Assists with goal setting and deciding what to do in intervention/therapy

	Frequency of Use in Clinical Practice	Strengths & Weaknesses of Client	Goal Setting & Intervention
Oral Expression Subtest (from Weschler Individual Achievement Test 2nd Edition WIATII)			
Test of Language Competence Level 2 (TLC 2)			
Renfrew Bus Story			
School Age Oral Language Assessment (SAOLA)			
Test for Auditory Comprehension of Language (TACL)			
Comprehensive Assessment of Spoken Language (CASL)			
100 Picture Naming Test			
Clinical Evaluations of Language Fundamentals 4th Edition(CELF-4)			
Expression, Reception and Recall of Narrative Instrument (ERRNI)			
Neale Analysis of Reading Ability			
Test of Written Language (TOWL)			
Children's Communication Checklist 2nd Edition (CCC 2)			
Test of Language Competence Level 1 (TLC 1)			
Peabody Picture Vocabulary Test (PPVT)			
Test of Problem Solving Elementary (TOPS)			
Renfrew Action Picture Test			

Assessments for Language Based Communication Disorders

(5-12 Year Age Group…)

Please highlight (up to) 4 assessments you use frequently (that weren't already in the survey) for the 5-12 year age group AND that you find useful in:

(a) Identifying a client's strength and weaknesses

(b) Assist with goal setting and intervention practices

Assessment 1 _____

Assessment 2 _____

Assessment 3 _____

Assessment 4 _____

Clinical Evaluations of Language Fundamentals 4th Edition (CELF-4)

Have you used the Clinical Evaluations of Language Fundamentals 4th Edition (CELF-4) in clinical practice?

○ Yes
○ No

Please rate how strongly you agree or disagree about the following statements relating to the CELF-4

	Strongly Disagree	Moderately Disagree	Mildly Disagree	Mildly Agree	Moderately Agree	Strongly Agree
An assessment where you interpret a child's performance based on index scores	○	○	○	○	○	○
An assessment where you interpret a child's performance based on individual subtests	○	○	○	○	○	○
An assessment which accurately demonstrates expressive language skills	○	○	○	○	○	○
An assessment which accurately demonstrates receptive language skills	○	○	○	○	○	○
An assessment which shows functional capabilities	○	○	○	○	○	○
An assessment which you use according the guidelines set out in the manual	○	○	○	○	○	○
An assessment you can compare to their peers	○	○	○	○	○	○
Everyone uses it so I use it	○	○	○	○	○	○
Good assessment which provides a lot of information	○	○	○	○	○	○
It is evidenced based	○	○	○	○	○	○
It's quick and easy to use	○	○	○	○	○	○
It's the assessment I am most familiar with	○	○	○	○	○	○
It's the gold standard when assessing children with communication disorders	○	○	○	○	○	○
Only assessment which assess receptive and expressive language	○	○	○	○	○	○
Reflects their performance outside testing situation	○	○	○	○	○	○
Something you can use for future management of the client	○	○	○	○	○	○

CELF-4

How often would you tabulate each index/supplementary score of the CELF-4 when you conduct a language based communication assessment?

	Never (0%)	Infrequent (<25%)	Somewhat Frequent (25 %< 50%)	Frequently (50% <85%)	Majority of the Time (>85%)
Core Language	O	O	O	O	O
Expressive Language	O	O	O	O	O
Language Content	O	O	O	O	O
Language Memory	O	O	O	O	O
Language Structure	O	O	O	O	O
Phonological Awareness	O	O	O	O	O
Pragmatic Profile	O	O	O	O	O
Rapid Automatic Naming	O	O	O	O	O
Receptive Language	O	O	O	O	O
Word Association	O	O	O	O	O
Working Memory	O	O	O	O	O

Identification of Language Impairment & The CELF-4

Please indicate which sub tests on the CELF-4 are more likely to identify a child who has a language based communication impairment.

(i.e.: which sub test on the CELF-4 will a child with a communication/language impairment find more difficult).

	Never	Very Unlikely	Somewhat Unlikely	Somewhat Likely	Very Likely	Definitely
Concepts & Directions	O	O	O	O	O	O
Expressive Vocabulary	O	O	O	O	O	O
Familiar Sequences	O	O	O	O	O	O
Formulated Sentences	O	O	O	O	O	O
Numbers Repetition Backwards	O	O	O	O	O	O
Numbers Repetition Forward	O	O	O	O	O	O
Recalling Sentences	O	O	O	O	O	O
Semantic Relationships	O	O	O	O	O	O
Sentence Assembly	O	O	O	O	O	O
Sentence Structure	O	O	O	O	O	O
Understanding Spoken Paragraphs	O	O	O	O	O	O
Word Classes Expressive (58yr age group)	O	O	O	O	O	O
Word Classes Expressive (9–21yr age group)	O	O	O	O	O	O
Word Classes Receptive (58yr age group)	O	O	O	O	O	O
Word Classes Receptive (9–21yr age group)	O	O	O	O	O	O
Word Classes Total (58yr age group)	O	O	O	O	O	O
Word Classes Total (9–21yr age group)	O	O	O	O	O	O
Word Definitions	O	O	O	O	O	O
Word Structure	O	O	O	O	O	O

Working Memory & The CELF-4

Please rate the likelihood of working memory influencing the client's performance on each subtest of the CELF4.

NB: Working Memory is defined as the temporary storing and manipulation of information (Baddeley, 1997).

	Never	Very Unlikely	Somewhat Unlikely	Somewhat Likely	Very Likely	Definitely
Concepts & Directions	O	O	O	O	O	O
Expressive Vocabulary	O	O	O	O	O	O
Familiar Sequences	O	O	O	O	O	O
Formulated Sentences	O	O	O	O	O	O
Numbers Repetition Backwards	O	O	O	O	O	O
Numbers Repetition Forward	O	O	O	O	O	O
Recalling Sentences	O	O	O	O	O	O
Semantic Relationships	O	O	O	O	O	O
Sentence Assembly	O	O	O	O	O	O
Sentence Structure	O	O	O	O	O	O
Understanding Spoken Paragraphs	O	O	O	O	O	O
Word Classes Expressive (5–8 years age group)	O	O	O	O	O	O
Word Classes Expressive (9–21 year age group)	O	O	O	O	O	O
Word Classes Receptive (5–8 years age group)	O	O	O	O	O	O
Word Classes Receptive (9–21year age group)	O	O	O	O	O	O
Word Definitions	O	O	O	O	O	O
Word Structure	O	O	O	O	O	O
Concepts & Directions	O	O	O	O	O	O
Expressive Vocabulary	O	O	O	O	O	O
Familiar Sequences	O	O	O	O	O	O

Discourse Assessment: Paediatric Population

Discourse can be defined as a series of connected sentences that conveys a message or an expression of ideas. It can involve two different contexts spoken form or written form.

(See Strass Hough & Pierce 1994)

How often would you assess discourse abilities in routine clinical practice of language based communication disorders?

	Never (0%)	Infrequent (<25%)	Somewhat Frequent (25 %< 50%)	Frequently (50% <85%)	Majority of the Time (>85%)
Informal Discourse Analysis (general observation of client providing global overview of client)	O	O	O	O	O
Formal Discourse Analysis (use of a specific assessment with some form of analysis after the assessment)	O	O	O	O	O

How often would you include the following as an evaluation of discourse in your assessment of language based communication difficulties?

	Never (0%)	Infrequent (<25%)	Somewhat Frequent (25 %< 50%)	Frequently (50% <85%)	Majority of the Time (>85%)
Narrative	O	O	O	O	O
Procedure	O	O	O	O	O
Conversation (between clinician & client)	O	O	O	O	O
Description	O	O	O	O	O
Recount	O	O	O	O	O
Conversation (between client & significant other)	O	O	O	O	O
Verbal and Non Verbal Pragmatic Skills	O	O	O	O	O
Exposition	O	O	O	O	O
Argument	O	O	O	O	O
Persuasion	O	O	O	O	O

Other (please specify)_____

Discourse Assessment: Paediatric Population

Please identify to what degree you agree or disagree about the following statements regarding the assessment of discourse.

	Strongly Disagree	Moderately Disagree	Mildly Disagree	Mildly Agree	Moderately Agree	Strongly Agree
I think discourse analysis is an important component of a language assessment.	○	○	○	○	○	○
Discourse analysis is time consuming and I don't have time to complete assessments.	○	○	○	○	○	○
I would use a discourse assessment as my first assessment of the child	○	○	○	○	○	○
Discourse analysis does change the management of the child in clinical practice.	○	○	○	○	○	○
I use discourse analysis as part of ongoing assessment to monitor improvement in the child's communication skills.	○	○	○	○	○	○
Schools or families are interested in discourse results.	○	○	○	○	○	○
I understand what discourse assessment is.	○	○	○	○	○	○
Discourse assessment is the gold standard when assessing a child's communication skills.	○	○	○	○	○	○
Discourse assessment involves the assessment of a child's pragmatic skills.	○	○	○	○	○	○
I feel comfortable in assessing a child's discourse skills.	○	○	○	○	○	○
I know of discourse assessments I could use in clinical practice.	○	○	○	○	○	○
Discourse does not change the management of the child in clinical practice	○	○	○	○	○	○
I am aware of what to analyse in discourse analysis	○	○	○	○	○	○

Are your answers based on your clinical experience with Developmental Paediatric Language delays and disorders? (If you answered questions based on experience with Paediatric TBI click NO)

○ Yes

○ No

Assessment of Language Based Communication Disorders after Traumatic Brain Injury

Have you ever in your clinical work assessed a child with a traumatic brain injury?
○ Yes
○ No

The number of children I have assessed with an acquired cognitive communication impairment after TBI would be approximately?
○ 1
○ <5
○ <10
○ <15
○ >15

In what clinical setting have you assessed a child with an acquired cognitive communication impairment after a TBI?
○ Inpatient Hospital (Acute and/or Rehabilitation)
○ Outpatient / Community Rehabilitation
○ Community Health / Clinic Based Services
○ Preschool / School Based Services
○ University
○ Private Practice
○ Other

Would your assessment of a child with acquired cognitive communication impairment after TBI differ from that of a child with a developmental language delay / disorder?
○ Yes
○ Unsure
○ No

Imagine you were now only assessing children with language based communication difficulties following a traumatic brain injury.

How often do you think you would use the following as part of your initial communication assessment?

	Never (0%)	Infrequent (<25%)	Somewhat Frequent (25 %< 50%)	Frequently (50% <85%)	Majority of the Time (>85%)
Clinical Evaluations of Language Fundamentals 4th Edition (CELF-4) or Preschool Edition (CELF P)	○	○	○	○	○
Clinical Evaluations of Language Fundamentals Preschool (CELF P)	○	○	○	○	○
Other Standardised Assessment not mentioned	○	○	○	○	○
Formal Discourse Assessment	○	○	○	○	○
Informal Discourse Assessment	○	○	○	○	○
High Level Language Assessment	○	○	○	○	○
Literacy Assessment (written language and reading assessment)	○	○	○	○	○
Parent/carer completed questionnaire of the child's communication skills	○	○	○	○	○

Other Standardised Assessments (besides CELF) (please specify)_____

If you were to use the CELF-4 to assess language based communication difficulties, how often do you think you would tabulate each index/supplementary score of the CELF-4?

	Never (0%)	Infrequent (<25%)	Somewhat Frequent (25 %< 50%)	Frequently (50% <85%)	Majority of the Time (>85%)
Core Language	○	○	○	○	○
Expressive Language	○	○	○	○	○
Language Content	○	○	○	○	○
Language Memory	○	○	○	○	○
Language Structure	○	○	○	○	○
Phonological Awareness	○	○	○	○	○
Pragmatic Profile	○	○	○	○	○
Rapid Automatic Naming	○	○	○	○	○
Receptive Language	○	○	○	○	○
Word Association	○	○	○	○	○
Working Memory	○	○	○	○	○

Thank you very much for completing this questionnaire: Please click NEXT to finish this questionnaire?
○   Next

The End

Thank you very much for your participation. Your time and effort has been greatly appreciated.

Kind Regards,
Matthew Frith

Appendix F - Online Survey Questions for SLPs

working in Adult TBI

Matthew Frith
Research Higher Degree Candidate

University of Sydney
Speech Pathologist / Team Leader
Kaleidoscope: Hunter Children's Health Network

PO BOX 2563
DANGAR NSW
AUSTRALIA 2309

(P) +61(0)2 4925 7820
(F) +61(0)2 4925 7955
(E) matthew.frith@hnehealth.nsw.gov.au

Introduction

You are invited to take part in a research study involving the assessment of language and communication skills. This is part of a wider study investigating the assessments measuring language and communication after a traumatic brain injury in childhood.

This study is being conducted by Matthew Frith, Speech Pathologist with Kaleidoscope's Paediatric Brain Injury Rehabilitation Team, Newcastle, NSW, Hunter New England Health.

This study is being conducted as part of Matthew Frith's Research Higher Degree (Speech Pathology) with the University of Sydney under the supervision of Associate Professor Leanne Togher.

If you complete the survey online you are consenting to participate in the study. It is important you read and understand this form. It describes the purpose, benefits and risk of the study as well as your right to withdraw.

Aims of the study

The aims of the study are to:

(c) Identify the assessments used by clinicians in the area of language and communication with children who have sustained a traumatic brain injury and children with developmental language delays and/or disorders.
(d) Identify the similarities and differences in assessment procedures of language based communication disorders with adults and children who have sustained a traumatic brain injury
(a) Identify the similarities and differences in assessment procedures of language based communication disorders with children who have acquired language based communication difficulties, compared to children with developmental language based communication disorders and/or delays.

Who is being asked to participate?

Speech Language Pathologists who provide clinical assessment of language based communication disorders only in the following areas are invited to take part in this study:

3. Children's rehabilitation after Traumatic brain injury (TBI)
4. Adult rehabilitation after traumatic brain injury (TBI)
5. Children with developmental language disorders and/or delays. This does not include children with a profound intellectual disability or children who are nonverbal in their communication.

What choice do you have?

Participation in this research survey is entirely voluntary and anonymous. Whether or not you to decide to participate will not affect you or your professional relationships with the health service or university.

What will you be asked to do?

If you agree to participate you will be asked to complete this anonymous survey.

In this survey you will also be asked to:

(f) Provide information about your clinical expertise
(g) Complete questions about the school age population or adult population and the assessments you use to assess language based communication difficulties
(h) Complete questions about how you use assessments to assist with goal setting and therapy activities

(i)   Provide information about your use of assessment of discourse in clinical practice
(j)   Complete questions about their use (if applicable) of the Clinical Evaluation of Language Fundamentals Fourth Edition (CELF-4).

Risks

There are no risks associated with participating in this study. If you decide to complete the survey you will not be identified. There are no right or wrong answers and this survey is not about testing speech language pathologists about their clinical knowledge.

The questionnaire should take 10 minutes to complete for clinicians answering questions about adult traumatic brain injury, 20 minutes to complete for clinicians answering questions about paediatric traumatic brain injury and approximately 30 minutes for clinicians answering questions about developmental language impairment.

Benefits

It is possible that by completing these questionnaires you will assist in developing assessment protocols for children with acquired language based communication difficulties after a traumatic brain injury.

How will the information collected be used?

The findings of the research will be submitted in papers in scientific journals and presented at professional conferences. Individual participants will not be identified in any report or presentation. Information will also be used by the Research Higher Degree candidate, Matthew, for the completion of his thesis at the University of Sydney, working under the supervision of Associate Professor Leanne Togher.

What do you need to do to participate?

If you have understood the content of this information sheet please click "next" to start the survey. If there is anything you do not understand, or you have questions please contact:

Matthew Frith – Speech Pathologist Paediatric Brain Injury Rehabilitation Team,
Kaleidoscope Hunter Children's Health Network,
John Hunter Children's Hospital and Children, Young People & Family Services,
Newcastle NSW Australia 2302,
(T) +61(0)2 4925 7820
(E) matthew.frith@hnehealth.nsw.gov.au

Further information

If you would like further information about the project please contact:
Matthew Frith
(T) +61(0)2 4925 7820
(E) matthew.frith@hnehealth.nsw.gov.au.

Complaints about this research

This research has been approved by the Hunter New England Human Research Ethics Committee of Hunter New England Health reference 10/04/21/5/10. Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or if an independent person is preferred, to:

Dr Nicole Gerrand – Manager Research Ethics and Governance,
Hunter New England Human Research Ethics Committee,
Hunter New England Health, Locked Bag No 1,
New Lambton NSW 2305

(T) (02) 4921 4950,
(E) HNEHREC@hnehealth.nsw.gov.au.

Research team

Matthew Frith
Research Higher Degree Candidate

University of Sydney
Speech Pathologist / Team Leader
Kaleidoscope: Hunter Children's Health Network
Paediatric Brain Injury Rehabilitation Team

PO BOX 2563
DANAGAR NSW
AUSTRALIA 2309

(T) +61(0)2 4925 7820
(F) +61(0)2 4925 7955
(E) matthew.frith@hnehealth.nsw.gov.au

Associate Professor Leanne Togher
Principal Supervisor
Senior Research Fellow, National Health and Medical Research Council
Discipline of Speech Pathology
Faculty of Health Sciences, The University of Sydney
SYDNEY, AUSTRALIA

75 East St
PO Box 170, Lidcombe NSW 1825
Faculty of Health Sciences, The University of Sydney
(T) +61(0)2 9351 9639
(F) +61(0)2 9351 9163
(E) leanne.togher@sydney.edu.au

Professor Alison Ferguson
School of Humanities and Social Science
Faculty of Education & Arts

University of Newcastle
Callaghan, NSW
AUSTRALIA 2308
(T) +61(0)2 4921 5716
(F) +61(0)2 4921 7386
(E) alison.ferguson@newcastle.edu.au

Dr. Wayne Levick
Conjoint Associate Professor
University of Newcastle

Senior Clinical Neuropsychologist
Kaleidoscope Hunter Children's Health Network
John Hunter Children's Hospital
Locked Bag No 1
HUNTER REGION MAIL CENTRE, NSW AUSTRALIA 2310
(T) +61(0)2 4921 3752
(F) +61(0)2 4921 3740
(E) wayne.levick@hnehealth.nsw.gov.au

Dr Kimberley M. Docking
Discipline of Speech Pathology
The University of Sydney

PO Box 170
Lidcombe NSW AUSTRALIA 1825

(T) +61(0)2 9351 9694
(F) +61(0)2 9351 9173
(E) kimberley.docking@sydney.edu.au

Demographic Information

Please identify your current geographical location from the list below.
○ Metropolitan
○ Rural
○ Remote

Please complete the following. The answer relates to your work setting. (If you do not wish to complete this section please click "NEXT" and you will be moved on to the next question)
City/Town: _____

ZIP/Postal Code: _____

Country: _____

How long have you been working as a Speech-Language Pathologist?

○ <1year   ○ 4–6years   ○ 11–15years

○ 1–3years   ○ 7–10years   ○ >15years

Clinical Caseload

Please choose from the following options:

Which client group best represents your current clinical experience.
○ Developmental language delays/disorders in children
○ Rehabilitation of acquired language based communication disorders in children following a traumaic brain injury (TBI)

In which setting do you primarily provide a clinical service?
○ Inpatient Hospital (Acute and/or Rehabilitation)
○ Outpatient / Community Rehabilitation
○ Community Health / Clinic Based Services
○ Preschool / School Based Services
○ University
○ Private Practice
○ Other

Areas of Assessment for Language Based Communication Disorders (Adult Age Group)

How often would you investigate the following areas of language and communication in your assessment of the 5-12 year age group?

	Never (0% of clinical time)	Infrequent (<25% of clinical time)	Somewhat Frequent (25% <50% of clinical time)	Frequently (50% <85% of clinical time)	Majority of the Time (>85% of clinical time)
Receptive Language	○	○	○	○	○
Expressive Language	○	○	○	○	○
Verbal Pragmatic Skills	○	○	○	○	○
Non Verbal Pragmatic Skills	○	○	○	○	○
Discourse	○	○	○	○	○
Phonemic Awareness / Phonics	○	○	○	○	○
Word finding Skills	○	○	○	○	○
Receptive Vocabulary	○	○	○	○	○
High level Language	○	○	○	○	○
Problem Solving	○	○	○	○	○
Reading Decoding	○	○	○	○	○
Reading Comprehension	○	○	○	○	○
Written Language	○	○	○	○	○
Functional Communication	○	○	○	○	○

Assessments for Language Based Communication Disorders (Adult Age Group

Please highlight (up to) 4 assessments you use frequently (that weren't already in the survey) for the 5-12 year age group AND that you find useful in:

(a) Identifying a client's strength and weaknesses

(b) Assist with goal setting and intervention practices

Assessment 1 _____

Assessment 2 _____

Assessment 3 _____

Assessment 4 _____

Discourse Assessment: Adult TBI Population

Discourse can be defined as a series of connected sentences that conveys a message or an expression of ideas. It can involve two different contexts spoken form or written form.

(See Strass Hough & Pierce 1994)

How often would you assess discourse abilities in routine clinical practice of language based communication disorders?

	Never (0%)	Infrequent (<25%)	Somewhat Frequent (25 %< 50%)	Frequently (50% <85%)	Majority of the Time (>85%)
Informal Discourse Analysis (general observation of client providing global overview of client)	O	O	O	O	O
Formal Discourse Analysis (use of a specific assessment with some form of analysis after the assessment)	O	O	O	O	O

How often would you include the following as an evaluation of discourse in your assessment of language based communication difficulties?

	Never (0%)	Infrequent (<25%)	Somewhat Frequent (25 %< 50%)	Frequently (50% <85%)	Majority of the Time (>85%)
Narrative	O	O	O	O	O
Procedure	O	O	O	O	O
Conversation (between clinician & client)	O	O	O	O	O
Description	O	O	O	O	O
Recount	O	O	O	O	O
Conversation (between client & significant other)	O	O	O	O	O
Verbal and Non Verbal Pragmatic Skills	O	O	O	O	O
Exposition	O	O	O	O	O
Argument	O	O	O	O	O
Persuasion	O	O	O	O	O

Other (please specify)_____

Discourse Assessment: Ault TBI Population

Please identify to what degree you agree or disagree about the following statements regarding the assessment of discourse.

	Strongly Disagree	Moderately Disagree	Mildly Disagree	Mildly Agree	Moderately Agree	Strongly Agree
I think discourse analysis is an important component of a language assessment.	○	○	○	○	○	○
Discourse analysis is time consuming and I don't have time to complete assessments.	○	○	○	○	○	○
I would use a discourse assessment as my first assessment of the adult	○	○	○	○	○	○
Discourse analysis does change the management of the adult in clinical practice.	○	○	○	○	○	○
I use discourse analysis as part of ongoing assessment to monitor improvement in the adult's communication skills.	○	○	○	○	○	○
Schools or families are interested in discourse results.	○	○	○	○	○	○
I understand what discourse assessment is.	○	○	○	○	○	○
Discourse assessment is the gold standard when assessing a adult's communication skills.	○	○	○	○	○	○
Discourse assessment involves the assessment of a adult's pragmatic skills.	○	○	○	○	○	○
I feel comfortable in assessing a adult's discourse skills.	○	○	○	○	○	○
I know of discourse assessments I could use in clinical practice.	○	○	○	○	○	○
Discourse does not change the management of the adult in clinical practice	○	○	○	○	○	○
I am aware of what to analyse in discourse analysis	○	○	○	○	○	○

The End

Thank you very much for your participation. Your time and effort has been greatly appreciated.

Kind Regards,
Matthew Frith