New Zealand Speech Language Therapists' Knowledge of Hearing Loss and Perspectives on Collaboration with the Audiology Profession.

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Acknowledgements

What seems like only yesterday, I told my parents I was applying to complete a Masters of Audiology. When reflecting on the past two years, I had absolutely no idea of the challenge I was about to face academically. The further knowledge I have taken away from this experience is overwhelming, but nothing short of rewarding. When reflecting on my time at the University of Canterbury, it is clear there are many people who have also dedicated their time and energy into this journey. Unfortunately, there isn't time to thank you all, but there are a few that cannot go unnoticed.

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Abstract

Aims: The current study investigated New Zealand-based speech-language therapists' knowledge of hearing loss and perspectives on collaboration with the audiology profession. The study also aimed to identify therapists perceived needs for professional development around hearing loss and management. Further, barriers to successful collaboration were identified, including potential ways to overcome these in the future.

Methods: The first phase of the study included the development of an anonymous online questionnaire involving 48 questions. The questionnaire included three sections which focused on (a) demographics (b) knowledge of hearing loss, assessment and hearing devices and (c) perspectives on collaboration. Questions were developed based on studies previously completed by Coombe (2018); Kobylas (2016); Lass et al. (1985); Lass et al. (1989) and Lass et al. (1990). Study information and a link to the questionnaire were circulated to practising speech-language therapists. The survey required 15-20-minutes to complete.

The second phase of the study involved conducting semi-structured interviews with four New Zealand speech-language therapists' working in a range of clinical settings. Interview questions were developed from the questionnaire findings. For example, participants' experiences and future opportunities for collaboration with audiologists. The interviews ranged between 30 minutes to one hour. Each interview was transcribed verbatim and transcripts then thematically analysed.

Results: The questionnaire was fully completed by 25 New Zealand speech therapists. The results from the questionnaire demonstrated that respondents had a broad understanding of aspects of audiology, such as hearing anatomy, types of hearing loss and knowledge of audiological assessment and exposure to hearing technology. All participants had engaged in audiology-related training. However, aspects of audiology, such as hearing technology and the referral pathway to audiology services were identified as areas for future professional

development. Most questionnaire participants reported no prior collaborative experience with audiologists. This was further supported by interview data which indicated that a lack of understanding of the audiologist role and appropriate referral pathways were influencing opportunities for collaboration.

Conclusions: Overall, both the questionnaire respondents and interviewees identified that there is a need for professional development to support understanding of components of the audiology field. The findings demonstrate that speech-language therapists could benefit from increased access to audiology-related resources and professional development to enhance inter-professional collaboration in order to ensure that children and adults with speech, language and hearing needs, receive the best possible services.

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List of Abbreviations

AAC	Augmentative and Alternative Communication
ABR	Auditory Brainstem Response
ALD	Assistive Listening Device
AoDC	Advisor on Deaf Children
APD	Auditory Processing Disorder
ASHA	American Speech- Language- Hearing Association
BAHS	Bone Anchored Hearing System
CHL	Conductive Hearing Loss
COSI	Client Orientated Scale of Improvement
dB HL	Decibel Hearing Level
DEC	Deaf Education Centre
DHB	District Health Board
DHH	Deaf or Hard of Hearing
EAC	External Auditory Canal
EBP	Evidence Based Practice
ENT	Ear Nose and Throat (specialist)
HHIA-S	Hearing Handicap Inventory for Adults (short)
ICF	International Classification of Functioning Disability and Health Framework
IEP	Individual Education Plan
IHC	Inner Hair Cell
IPP	Inter-professional Practice
LOCHI	Longitudinal Outcomes of Children with Hearing Impairment
LTASS	Long-term Average Speech Spectrum

MDT	Multidisciplinary Team
MoE	Ministry of Education
MoH	Ministry of Health
NIHL	Noise Induced Hearing Loss
NZAS	New Zealand Audiological Society
NZSL	New Zealand Sign Language
NZSTA	New Zealand Speech-language Therapists' Association
OCHL	Outcomes of Children with Hearing Loss
OHC	Outer Hair Cell
OM	Otitis Media
PTA	Pure Tone Audiometry
RM	Remote Microphone
SD	Standard Deviation
SLP	Speech-language Pathologist
SLT	Speech-language Therapist
SNHL	Sensorineural Hearing Loss
TM	Tympanic Membrane
UNHSEIP	Universal New-born Hearing Screening Early Intervention Programme
VRA	Visual Reinforcement Audiometry
WHO	World Health Organisation

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1 Introduction

Communication is a complex interaction and an important skill that humans engage in daily. Communication underpins learning, social interaction and overall well-being. At a basic level, effective communication enables individuals to convey their needs and wants to a desired conversational partner (Jackson, Traub, & Turnbull, 2008). Hearing loss as well as speech and language difficulties restrict the ability to communicate freely (Schauwers et al., 2004). Hearing loss is a contributor to speech and language delays and impairments. Current estimates suggest 360 million (5.3% in total, 32 million children) of the population world-wide are impacted by hearing loss (Exeter, Wu, Lee, & Searchfield, 2015). Specific to the New Zealand context, it is estimated roughly 9% of the population are affected by some degree of hearing loss (MacPherson, 2014). Reduced access to acoustic stimuli results in reduced access to speech sounds, words and intonation patterns that convey meaning (Coene & Govaerts, 2014).

Speech-language therapists (SLTs) are responsible for the diagnosis, improvement, maintenance, reducing risks, educating and access to participation in the communication context for individuals who experience challenges communicating and swallowing. Their scope of practice requires collaboration with clients throughout the population in many contexts (for example, hospital, rest homes, community rehabilitation centres and voluntary organisations) at various periods of their life span (New Zealand Speech-language Therapists' Association (NZSTA), 2012).

This thesis aims to explore and understand SLTs knowledge of hearing loss as well as their experiences and perspectives on collaborating with audiologists. The intention is to determine if New Zealand based SLTs have a general understanding of hearing, hearing related disorders and hearing technology. To achieve this, the thesis reviews hearing loss, normal hearing anatomy and understanding and exposure to aural rehabilitation management

options. Further, perspectives on collaboration will be explored. It is hoped that gaining this information will support the identification of SLTs future learning needs to support inter-professional collaboration.

This chapter begins with a review of hearing and the anatomy and physiology of the hearing system. This is followed with a discussion of the types of hearing loss that occur when the normal hearing anatomy is impacted.

1.1 Hearing

Throughout infancy and early childhood, our hearing underpins the fundamental skills required for speech and language development. Further, our ability to perceive and understand speech signals enables us to acquire skills such as reading and writing which support academic and vocational achievements throughout life. However, hearing loss provides a range of challenges in multiple aspects of life. Individuals with hearing loss can experience disadvantages socially, emotionally, academically and financially (Ries, 1994). Hearing loss can have impacts on poor emotional health, employment, reduced cognitive function and reduced quality of life (Gallagher & Woodside, 2018; Hussain et al., 2018). The need to appreciate the ability to hear is often underestimated until an individual experiences some degree of loss (Ross, 1991).

Hearing loss is a common, misunderstood sensory impairment (Engdahl, Tambs, & Hoffman, 2013). Hearing loss can occur due to damage of the structures of the hearing system. There are multiple causes such as natural aging, noise exposure, ototoxic side effects, genetic mutations or other processes associated with chronic conditions (Cunningham & Tucci, 2017). As noted above, when access to acoustic and speech signals is reduced the quality and amount of sound that one experiences is significantly impacted. The following

section discusses the anatomy and physiology of the normal hearing system, prior to the occurrence of hearing loss.

1.2 Anatomy and physiology of the hearing system

1.2.1 Normal hearing mechanism

Normal hearing allows humans to engage and discriminate between loudness and pitch cues, leading to the discrimination of speech meaning. People with hearing within normal limits can perceive frequencies between 20 Hz and 20,000 Hz. Hearing sensitivity is greater in the range of 500 Hz and 8000 Hz, frequencies that are important for speech understanding (Schlauch & Nelson, 2015). The latter set of frequencies are routinely assessed during pure tone audiometric assessment. The human ear is made up of three main sections, containing various structures that allow the human species to process auditory signals within an environment. The structures can be divided into peripheral and central structures (Musiek & Baran, 2018).

1.2.2 Peripheral auditory system

1.2.2.1 Outer and middle ear structures

The outer ear consists of the two most outer structures, the pinna and external auditory canal (EAC). The pinna is responsible for collecting and directing sound waves from the environment. The grooves in the formation of the pinna have a role in this process. Thus, the pinna plays an important role in directional hearing. It allows the individual to determine whether a sound source is located above, below, in front or behind them. The sound waves are then directed along the auditory canal to the tympanic membrane (TM), located at beginning of the middle ear structure (Hoth & Baljić, 2017). The EAC structure contains both

cartilaginous and bony portions. The lateral cartilaginous one-third of the EAC is responsible for the production of cerumen (ear wax).

The middle ear comprises the TM and the ossicles. It is a remarkably developed structure that ensures its mechanical complexity. The malleus, incus and stapes are the ossicles located in the middle ear cavity. They are connected by synovial joints to allow a certain degree of movement. This movement is triggered by the energy of collected sound waves. The first ossicle, the malleus is connected to the TM. When the TM collects sound waves it causes the ossicles to vibrate, mechanically conducting sound to the cochlea, the structure of the inner ear (Musiek & Baran, 2018).

1.2.2.2 Sensory organ/ inner ear

The cochlea, commonly referred to as the organ of hearing, is responsible for the perception of sound waves, due to the nature and anatomy of the sensory organ. The cochlea is organised tonotopically, where the high frequencies are processed at the basal end of the basilar membrane and the low frequencies at the apical end. The organ of Corti houses the outer hair cells (OHCs) and the inner hair cells (IHCs).

The OHCs are responsible for the amplification of soft sounds. The IHCs complete a mechanical process, where mechanical movement of the stereocilia becomes an electrical signal (Fettiplace & Kim, 2014). After the mechanoelectrical transduction process is complete, the sound is transmitted along the 8^{th} nerve, along the central auditory nervous system. The auditory nervous system ends with the auditory cortex, where the signal is processed at neural level (Hoth & Baljić, 2017; Musiek & Baran, 2018). The discussion below outlines the types of hearing loss that can occur when the above structures are damaged, causing both peripheral and central hearing impairment.

1.3 Types of hearing loss

1.3.1 Congenital hearing loss

A congenital hearing loss is present at birth. It has adverse effects on communicative abilities, impacting the formation of the foundations required for literacy development. If hearing aids or other devices are not fitted appropriately, access to speech signals is reduced as speech will be audible but not intelligible. This contributes to further deficits for speech and language development (Coene & Govaerts, 2014; Flexer, 1999) Congenital hearing loss is one of the most chronic conditions to occur in the paediatric population (Korver et al., 2017). TORCH diseases encompass a range of infections that can occur pre-or post natally, contributing to significant adverse effects, such as hearing loss. The TORCH acronym represents the following diseases, (T)oxoplasmosis, (O)ther agents, (R)ubella, (C)ytomegalovirus and (H)erpes simplex (Neu, Duchon, & Zachariah, 2015). Congenital cytomegalovirus is an example of a non-genetic sensorineural hearing loss (SNHL) (Rawlinson et al., 2018). Further, there is a vast range of syndromic hearing losses that can have significant impacts on an individual. Trisomy 21, more commonly termed down syndrome, is known for the increased risk of hearing loss. It is noted that 50-90% of individuals with a diagnosis of down syndrome will develop a mild to moderate hearing loss (Stewart, Gallagher, & Leyden, 2018).

The implementation of the Universal New-born Hearing Screening Early Intervention Programme (UNHSEIP) ensures each new-born is screened to identify whether an individual has a hearing loss. This ensures early detection, which in turn can support timely intervention for the paediatric population (Korver et al., 2017).

1.3.2 Acquired hearing loss

Hearing loss can develop during childhood or later in life. It is not always present from birth. There are many causes for acquired hearing losses. As noted by Parham, Lin, Coelho, Sataloff, and Gates (2013) presbycusis or more commonly known as 'aging hearing' is one of the most prevalent forms of acquired hearing loss in adults (Gates & Mills, 2005; Liberman, Liberman, & Maison, 2015).

Today, many people are exposed to work environments where there are sources of unwanted 'noise'. Noise over a given sound pressure level with exposure over a significant period can lead to a temporary threshold shift, or more severely, a permanent change in hearing threshold. Originally, noise induced hearing loss (NIHL) impacted a large proportion of the population with an increase in automatic machinery and when World War II veterans returned home after prolonged periods of exposure to gunfire, machinery and explosives. The increase in prevalence of NIHL, saw the need for further expansion in the audiology profession (Fligor, Chasin, & Neitzel, 2015).

Hearing loss can also occur post infection. There have been many reported cases of measles, mumps, meningitis and chicken pox contributing to an observed hearing loss (Klein, Koedel, Pfister, & Kastenbauer, 2003). Auditory neuropathy spectrum disorder is another pathology that may occur and be identified in childhood (Teagle et al., 2010). Further, people can acquire hearing loss via ototoxic medication or trauma for example, an enlarged vestibular aqueduct (Noordman et al., 2015). It is important to consider the impact a hearing loss acquired later in life will have on speech and language development, in contrast to an individual who is born with a congenital loss.

1.3.3 Conductive hearing loss

Conductive hearing loss (CHL) is typically categorised as a peripheral loss, impacted by impairment of the outer or middle ear. In a CHL, the prevalence of having a low frequency hearing loss is higher than a flat audiometric configuration. Some CHL can be treated through surgical or medical treatment. More severe conductive impairment cannot be treated, only managed (Steiger, 2015).

1.3.4 Sensorineural hearing loss

SNHL is another type of peripheral hearing loss. Commonly caused by dysfunction of the cochlea and further neural anatomy (sensorineural mechanism). A SNHL typically presents as a loss, initially in the high frequencies, but can progress to a loss across all frequencies (Schlauch & Nelson, 2015). SNHL is often described as a permanent loss with no management options available to reverse the anatomical damage (Pajor & Jozefowicz-Korczynska, 2008).

1.3.5 Mixed hearing loss

Mixed hearing loss presents when an individual exhibits pathology in both the conductive and sensorineural mechanism (Schlauch & Nelson, 2015). Both the air conduction and bone conduction pathways are impaired.

The following section discusses the prevalence of hearing loss on a global scale. Further, the prevalence of hearing loss specific to the New Zealand population is outlined.

1.4 Prevalence

The World Health Organisation (WHO) aimed to standardise the way hearing loss is classified. It was decided that the severity of hearing loss was best used to define each loss.

This played a critical role in understanding the global prevalence of hearing loss and deafness (Humes, 2019; World Health Organization (WHO), 2007).

Today, there are different classifications that can be used to describe the severity of a hearing loss. As cited in the University of Canterbury, Audiology Clinical Protocols and Guidelines, Goodmans and Jerger and Jerger, have slight differences between their classification of hearing loss (Schlauch & Nelson, 2015; University of Canterbury, 2019). There are various factors such as how the hearing loss has been determined, how the hearing loss is defined and what severity of loss is considered within the statistics. Regardless of the method used to obtain the reported prevalence, it is known that hearing loss has a large impact globally (Cruickshanks et al., 1998). With people living longer, in an aging society, the importance for treating hearing loss is critical (Wallhagen, 2010).

1.4.1 Global perspective

WHO, has estimated that around three hundred and sixty million people are affected by a disabling hearing loss. This makes up 5.3% of the world's population, resulting in feelings of isolation and frustration (Lopez-Poveda et al., 2017). It is estimated that 77% of people over the age of 60 will have some degree of high-frequency hearing loss and 50% in adults over the age of 75 (Wallhagen, 2010).

In Australia, it is believed the figures include 70% of adults over the age of 70 years have some degree of hearing loss. It is estimated that statistics are similar across other developed countries. Making hearing loss a common chronic health condition experienced by older adults worldwide (Meyer, Hickson, Lovelock, Lampert, & Khan, 2014). However, the impact hearing loss has on younger generations cannot be overlooked. Data from a recent study in the United States suggest that hearing loss is becoming more prevalent at a younger age (Agrawal, Platz, & Niparko, 2008). Data from the new born hearing screening

programmes suggest that 1-3 children per 1000 are born with a hearing loss (American Speech-Language-Hearing Association (ASHA), 2019).

1.4.2 New Zealand perspective

The 2001 census data discusses the prevalence of known hearing loss amongst the New Zealand population. It was identified that for individuals 15 years or older not living in institutions (for example, people in care homes are excluded from this result), the prevalence was 7.5%. The severity of the hearing loss was not discussed (Greville & Oticon Foundation of New Zealand, 2005).

Later in 2013, the disability survey found that 9% of the total population in New Zealand were impacted by hearing loss. They further discussed that men (12%) were more likely to experience hearing loss than women (9%) in the adult population. In children hearing loss was equally likely between genders (1%). Further, the survey identified a strong correlation between hearing loss and age. For adults over the age of 65 years, 23% of women and 34% of men reported a hearing loss. For males and females between the ages of 15 and 44, respectively 5% and 3% identified with hearing loss (Stats New Zealand, 2013).

Exeter et al. (2015) determined age and gender specific estimates of individuals in New Zealand who will experience a hearing loss over the next fifty years. It was found that there will be a significant projection in hearing loss in individuals over the age of fourteen years. Hearing loss rates are expected to double for adults over the age of seventy between 2011 and 2061. Further, it was found that hearing loss is more prevalent in males than females.

The Deafness Notification Report (2016) published by Enable New Zealand, discusses the number of known cases of hearing loss among New Zealanders under the age of 19 years. The known cases are those that ventilation tubes (more commonly referred to as

grommets) cannot remediate. A total of 1344 cases were identified, with 7% being identified as single sided deafness and 93% having unknown aetiology (Digby, 2017).

The above statistics all vary due to demographic factors such as age, living conditions and gender. Each factor provides a challenge in obtaining data that specifically represents the entire New Zealand population. To ensure that the correct number of hearing losses are identified within the New Zealand population, it is critical hearing is assessed. The next section discusses the spoken communication chain, considering the impacts hearing loss causes in verbal conversation.

1.5 The spoken communication chain

The spoken communication chain is a succinct approach summarising the range of events that occur when a communication partner wants to convey information to a listener. It comprises an auditory-oral exchange in which ideas, emotions and concepts are portrayed between the sender and receiver. The chain is initiated when the speaker determines their exact message by encoding their concepts. This occurs in the brain at the linguistic level, where the syntactic structure is developed. The speaker continues to send a speech signal into the environment, at the physiological level or via motor processes. The production of speech creates a sound wave which is received by the listener at the acoustic or optical level. Speech is depicted through visual cues, created by the movement of the mobile and immobile speech articulators (Humes & Bess, 2014).

The listener's role is to receive the message at the physiological level. The stimuli received by the listener is processed by the eyes and ears, sending critical information to both the auditory and visual nervous systems. The listener then extracts the message at the linguistic level via decoding. An individual uses these processes to ensure the semantic meaning is extracted (Humes & Bess, 2014).

There are many instances where this pathway can be interrupted, impacting the ability to communicate freely. Hearing loss can cause a breakdown in this chain restricting the ability to learn speech and language. Further, a speech or language impairment can restrict one's ability to communicate an idea restricting the acoustic signals released to the environment. This signifies the importance of speech therapy and audiology services collaborating to support individuals with speech, language and hearing needs.

An individual with hearing loss, speech or language impairment will engage in conversation with many people daily. It is critical to understand how their communication abilities will be impacted when a breakdown in the communication chain occurs. The section below discusses acoustic phonetics, detailing how speech signals are produced. Further, the section signifies the importance of acoustic phonetics, upon considering the fitting of a hearing device.

1.6 Acoustic phonetics

Acoustic phonetics is a young science that refers to the study of soundwaves, produced by the vocal folds (Stevens & Weismer, 2001). There are many closely associated sciences such as speech physiology and speech perception. The concepts of acoustic phonetics provide the foundational concepts underpinning everyday verbal communication.

Not only is the linguistic science essential for understanding the link between production of speech and the auditory system, it is also essential in providing understanding for visual cues required for communication.

1.6.1 Source-filter theory

Originally developed for the study of human vocalisations, the source-filter theory encompasses the study of speech production. The source-filter theory includes a model

outlining the requirements that link vocal production, acoustic structure, functional discrimination and perception (Taylor & Reby, 2010).

The vocal apparatus is commonly referred to the 'source'. This is inclusive of the larynx and laryngeal structures such as the vocal folds. Further, the 'filter' can be defined as the laryngeal structures that attach to the mouth and nose. From here, the sound is filtered out into the environment (Titze, 2000).

Each speech phoneme can be defined by place, manner and voicing. The place of articulation refers to where the obstruction occurs between the vocal tract and articulatory gesture. The articulators create an obstacle for the passing air. Manner of articulation is the interaction or the point of contact between the mobile and immobile articulators and the way the resonance of a speech sound is affected. Voicing refers to the movement of the vocal folds at the time of articulation and the formant structure observed in the production of vowels, where the fundamental frequency is considered (Easwar, Scollie, & Purcell, 2019; Taylor & Reby, 2010).

1.6.2 The speech spectrum

The long-term average speech spectrum (LTASS) is the average intensity level over a segment of speech, in a long-term conversational setting. It considers the dynamic range, determining the range between the lowest (minima) and the highest (maxima) intensity level of speech. The LTASS considers the average level from the recorded speech spectrum, taken from a fixed location from the original source, the speaker (Cornelisse, Gagné, & Seewald, 1991; Mueller, Ricketts, & Bentler, 2014).

Plotted in decibel hearing level (dB HL), the LTASS can be plotted onto a typical audiogram. The audiogram is used to demonstrate the lowest level an individual can perceive a pure tone, or what is known as the 'hearing threshold'. The LTASS is depicted using the same scale. Therefore, it can be used to determine or predict the level of speech that is

audible to an individual, as the relationship between the hearing threshold and level of speech is demonstrated (Mueller et al., 2014). The LTASS is commonly used in the prescription and evaluation of hearing aid fittings. Below is a discussion outlining some of the considerations audiologists must make to ensure an effective fitting for each individual (Byrne et al., 1994).

1.6.3 Acoustic phonetics and hearing aid fitting

Understanding the speech spectrum and how different severities of hearing loss configurations will impact the way someone can hear and perceive speech sounds is critical. It is essential that the implications are considered when fitting a hearing aid (Walker, 1997).

Firstly, the differences between gender and individual speech spectrums is significant. It is known that men are louder and their speech spectra is lower in comparison to women and children. This is a result of their vocal tract anatomy and the vibrations of the vocal folds developed at a different frequency. A common complaint is that women and children are harder to hear, due to the different resonant frequency produced, by their anatomy. This is one consideration when fitting hearing aids. It is essential to ensure that the average, soft and loud speech are adjusted to fit the prescribed target gain that is derived from a child or adult's hearing thresholds shown on their audiogram (Taylor & Reby, 2010).

Further, understanding the resonant frequencies of each individual phoneme is important. For example, people with a high frequency loss will miss speech phonemes such as /s/ and /f/, or in contrast a low frequency loss where /m/ and other nasals or vowels are produced (Sivaraman, Mitra, Nam, Saltzman, & Espy-Wilson, 2015). We must remember that speaking louder won't necessarily increase speech intelligibility. When the volume increases, the speech spectrum also changes.

With the foundational understanding of these concepts individuals will have access to audible or intelligible speech phonemes that can support the understanding of speech and

language. The following section considers the role of hearing when an individual is developing the foundations for speech and language development.

1.7 Role of hearing in speech and language development

Communication is a complex interaction, that has acoustic, linguistic and physiological components (Humes & Bess, 2014). It is noted that hearing loss is a prevalent contributor to speech and language disorders. The importance of ensuring normal hearing sufficient for the normal development of speech and language is significant.

As noted by Lang-Roth (2014) audibility of the frequencies between 500 Hz – 4 kHz is essential for speech and language development. They are important frequencies that carry significant speech meaning. Clinically, the audiogram is considered when determining the management for an individual client. When considering the varying classifications of hearing loss individuals will be impacted in different ways. For example, a CHL that is fluctuating in nature, can be a result of infection or obstruction in the external ear canal or middle ear cavity. It is essential that a hearing loss of this nature is monitored regularly.

In contrast a SNHL impacts the cochlear anatomy and is permanent in nature. Powell, Boon, and Luckner (2019) note that one population that often struggles to develop language are children who have hearing loss or are profoundly deaf. The above examples are clinically important as they influence the management approach and impact speech and language development differently.

However, the term ‘hidden hearing loss’ has recently grown to encompass those with difficulty understanding speech in noise even with a normal pure-tone audiometric assessment. Although a normal audiogram is often an indicator of peripheral hearing sufficient for speech and language development it is not always a direct predictor of how one will participate in everyday listening conditions (Pillion, 2012). Clients who present with

central disorders or eighth-nerve disorders must also be considered. Clinically we must remember that beyond peripheral auditory sensitivity people can experience implications functionally, such as difficulty listening in noise, a common complaint in those with auditory processing disorder (APD) (Moore, 2018; Musiek, Chermak, Bamiou, & Shinn, 2018).

Skarzyński and Piotrowska (2012) discusses the co-occurrence of these two communication disorders and how one can impact the success of the development of the other. Professionals in the field of communication disorders must understand the typical pattern of development for speech, language and hearing (Sheridan, Sharma, & Cockerill, 2014).

Yoshinaga-Itano, Coulter, and Thomson (2000) discusses the importance of the UNHSEIP. Early identification has significant impacts on the long-term outcomes for speech and language development. The study considered 50 children between the ages of 9 to 61 months old with bilateral hearing loss. Their screening status when born was noted and used to categorise them into treatment groups (screened, probably screened and probably not screened). After the administration of various speech and language assessment tools, it was found that those who were screened and had early identification of their hearing loss performed better. Thus, the new-born hearing screening programs are positively related to successful speech and language outcomes. Although this is important to understand when working in an early intervention setting, it is also critical to consider hearing losses that are acquired after birth and the associated impacts. There are multiple conditions that can lead to hearing loss. This reinforces the significance of professionals being able to identify hearing loss risk factors (Flynn, Austin, Flynn, Ford, & Buckland, 2004). Understanding New Zealand SLTs knowledge of risk factors is critical.

The Outcomes of Children with Hearing Loss (OCHL) study was designed to determine the impact of early service provision, upon completion of the new-born hearing

screen. The study looked to determine if early intervention influenced the prevention or contributed to minimising language delay, where untreated hearing loss was a contributing factor (Moeller & Tomblin, 2015b).

The study followed an accelerated longitudinal design where cross-sectional age cohorts were included. The final participant pool included 290 children who were hard of hearing and 117 children with normal hearing from various socio-economic backgrounds across various states in America. The inclusion criteria outlined the need for bilateral mild to severe hearing loss, an English-speaking home, no cochlear implants and no major secondary disability. Children were enrolled in the study between the age of six months through to six years and eleven months. Annual assessment was completed, with an increased rate of assessment before the age of two-years. The comprehensive test battery included audiological, language, development and family related assessment (Tomblin & Moeller, 2015).

The researchers found that audibility has an influence on growth rates. It was found that having hearing aids fitted and verified via real ear measures had an impact on the overall audibility the children had access to. The hearing devices worn consistently showed better outcomes and those fitted later in life still made progress upon receiving amplification. The fourth finding of this study is significant considering the language environments the children were exposed to. A responsive style to language rather than directive meant exposure to language was increased. Further, the researchers found that different areas of language are more at risk in children hard of hearing. Emphasis on this during intervention is critical. Finally, the study reports that service provision should be a priority for children hard of hearing (Moeller & Tomblin, 2015a).

The Longitudinal Outcomes of Children with Hearing Impairment (LOCHI) study is significant in the literature. The study explored the outcomes of 470 children in Australia

with permanent childhood hearing loss over a longitudinal, five-year period. The participants were fitted with either hearing aids or cochlear implants prior to turning three-years of age. When the children reached five-years a range of assessments were completed. The assessments included language, functional performance, speech perception and psychosocial skills. The measured results emphasise the importance of early intervention, with those fitted earlier portraying improved outcomes. Specifically, the study found that participants fitted with a device earlier had higher global language scores and better receptive and expressive language. Further, children with better language abilities also had better speech perception in a noisy environment (Ching, Dillon, Leigh, & Cupples, 2018). Both the OCHL and LOCHI studies have driven the early intervention service model for children who are hard of hearing. The results from both studies reinforce the significance of early intervention.

It is noted that roughly 95% of children who are hard of hearing have parents that are hearing. This means that their exposure to spoken communication is significantly higher than those who communicate in a circle of people who use non-verbal forms of communication. Often people have a low incidence of communicating with a person who has a hearing loss or profoundly deaf. This can lead to further impacts such as, whether people with less exposure to hearing loss have communication strategies to support conversation with an individual hard of hearing. Wider impacts such as social isolation and negative emotions can result for people with hearing loss. People use social interactions to understand social norms. Without hearing this can be challenging (Powell et al., 2019).

If an individual is unable to adapt to using other forms of communication it can consequently lead to further challenges when learning the foundations for speech and language. Without implementing communicative strategies such as using the individuals visual space, attention, turn-taking, assistive devices or non-verbal forms of communicating there will be a reduction in interactions. To support an individual with speech, language and

hearing impairment it is essential a holistic framework is implemented. Below is a discussion outlining The International Classification of Functioning, Disability and Health Framework (ICF), a foundational approach used when considering the assessment and management of speech, language and hearing impairment.

1.8 ICF framework

A hearing impairment impacts many aspects of an individual's life. The ICF provides a referent to better understand these impacts, while ensuring a common language is used amongst health professionals worldwide. WHO, ensures that health and disability are measured for a single individual or at population level. Based on a bio-psycho-social perspective, the ICF framework is effective in describing both functioning and disability. In reference to the framework, the terms 'functioning, activity and participation' are used to consider the positive aspects, while 'disability, impairment and handicap' explores the negative or challenging aspects of an impairment, ensuring a holistic approach (Granberg et al., 2014; Manchaiah, Möller, Pyykkő, & Durisala, 2015; World Health Organization (WHO), 2007).

The framework encompasses one's health condition and the impacts it has on the body structures and their functions, activity limitations and participation restrictions. The framework further incorporates contextual factors such as the environmental factors around them alongside their personal considerations. A vast range of activity limitations and participation restrictions are common for individuals who are hard of hearing. According to, Manchaiah et al. (2015) considering all aspects, both positive and negative, ensures critical dimensions of a case are considered. A contextual factor for one individual may have a positive impact on how one perceives and manages a hearing loss. In contrast, a similar contextual factor may have a negative connotation for another individual, leading to different

outcomes. Application of the ICF ensures that the needs of individuals and their significant others are considered when planning and managing support for a range of speech, language and hearing impairments.

1.8.1 Third party disability

Third party disability can be described as the disability experienced by family members due to a health condition their significant other experiences (Scarinci, Worrall, & Hickson, 2009). As discussed above, the ICF framework encompasses the individual and body structures and functions with a holistic approach. This ensures the consideration of all dimensions of the individual's life. Third party disability is no exception (Scarinci et al., 2009).

Not only can hearing loss impact the individual directly, further impacts can be experienced by a significant other, or key communication partner. The communication partner who has normal hearing can also experience activity limitations and participation restrictions. This is a result of them taking up extra responsibilities and having altered routines. It has been reported that key communication partners will often experience limitations in the domains of communication, relationships and inter-personal interaction Acknowledgement of the wider effects of hearing loss is critical to upholding family-centered care (Scarinci, Worrall, & Hickson, 2012).

1.8.2 Help-seeking

It is common that family members will be responsible for an individual's willingness to seek help. Further, it is also known that having a supportive network will increase the likelihood of an individual to benefit from intervention services (Scarinci et al., 2012).

Schulz et al. (2016) explored the factors that influence hearing evaluation, specifically considering perceived burdens for communication partners. The study found that people were more likely to seek hearing assessment when the perceived burden was higher. Further, Preminger, Montano, and Tjørnhøj-Thomsen (2015) considered adults' reflections on their experiences of being a child with a parent with hearing loss. The study involved twelve participants between the ages of 22 to 58 years, who had a parent with confirmed hearing loss and owned hearing aids. Each participant engaged in a semi-structured interview where impacts on communication and their relationship with their parent, due to the hearing loss were discussed. The results showed that participants experienced perceived burdens, but not to the greater extent to which the spouse is impacted. Although the relationships between child and parent is differing than those of spouses, there is still a level of support provided.

A study by Hallam, Ashton, Sherbourne, and Gailey (2008) investigated the impacts an acquired profound hearing loss has on the individual and how the family adjusts. An acquired profound loss presents different challenges to those of a mild-moderate severity. It has been found that the whole family require support to adjust to the sudden communicative challenges presented. The study emphasises that family-centered care should be the focus of intervention.

Carson (2005) examined the factors that are associated with help-seeking within the population of age-related hearing loss. The study found that one of the strongest influences on whether a person seeks hearing helped is linked to the relationships they hold and the communication issues within. It was found that daughters had a stronger influence in encouraging an individual to seek hearing help along with other family members.

The following studies all present with similar themes, in which an individual is more likely to engage in help seeking with the support of another individual, most commonly a key communication partner. Many of the studies above further discuss the importance of the third

party seeking help to support the impacts they too are experiencing (Carson, 2005; Hallam et al., 2008; Preminger et al., 2015; Schulz et al., 2016).

1.8.3 Evidence based practice

Evidence based practice (EBP) is the implementation of practices that are supported by past and current evidence, the integration of clinical expertise and considering clients perspectives and needs (Crowe, Masso, & Hopf, 2018). EBP ensures individuals' are provided with the most ethical and efficacious care (Boothroyd, 2007).

The above discussion about the ICF framework and third party disability emphasises the importance of that ensuring evidence based practice is implemented across all professions. As audiologists, we must ensure we are considering relevant research to determine the quality of the evidence supporting procedures implemented in clinical practice (Boothroyd, 2007). The following sections discuss the impacts children with hearing loss experience in an educational setting and the impacts adult experience socially and in the workplace. It is important evidence based practice is implemented when considering the best approaches to support individuals overcome these impacts.

1.9 Children with hearing loss; impacts in education

The above discussion highlights the importance of how individuals with hearing loss are impacted in regards to their speech and language development. The wider impact of hearing loss extends to educational and social settings. The key for deaf or hard of hearing (DHH) children is having access to fluent language in a range of formal and informal settings, such as the classroom (Knoors & Marschark, 2014). How teachers in mainstream school settings include DHH students was the focus of Vermeulen, Denessen, and Knoors (2012) study. The topic was researched via the implementation of interviews with nine

teachers. The study found that the teachers had a good awareness of communicative strategies to support the inclusion of DHH students. Some of these strategies were lip reading, the repetition of instructions and discussion to ensure the instructions were understood by the individual. On consideration of the teacher's emotions and beliefs about the inclusion of DHH students, it was found that on some occasions the teachers found it harder to include a DHH that was demonstrating deviant behaviours, in contrast to making minor changes to teaching strategies to support individuals DHH with non-deviant behaviours.

Harris and Terlektsi (2011) studied the reading and spelling abilities of adolescents wearing cochlear implants and hearing aids, whom are deaf. The eighty-six participants were aged between 12 to 16 years. The participants were split into three groups according to their fitted hearing technology and the age at which they received it. Twenty-seven participants were currently fitted with hearing aids, thirty were implanted prior to 42 months of age and the remaining twenty-nine participants were implanted later (after 42 months). The results of the study demonstrate that regardless of the device they were fitted with, the participants have average reading ages that are below those expected for their chronological age.

Geers, Tobey, Moog, and Brenner (2008) explored the long-term outcomes of cochlear implantation in the pre-school years, through to elementary grades and high school. The purpose of the study was to follow the speech, language and reading abilities of the individuals throughout their educational years. The study focussed on eighty-five adolescents from North America, who were originally recruited from a larger population sample. The participants were initially tested in their elementary school years (8-9 years of age) and then re-tested in high school (aged 15-18 years). Overall, the results showed early cochlear implantation had positive long-term impacts for auditory and verbal development, encompassing speech and language development. Upon consideration of the participants

reading abilities it was found that early implantation did not result in age-appropriate reading levels when assessed in their high school years.

Further research has noted the gap in achievement between DHH children and normal hearing children from the USA. Findings, based on achievement testing show that in school there is a wide gap between achievement levels, compared to their normal hearing peers. As the individuals' progress through their schooling years, it has been found that the gap may remain and continue to widen. The study suggests that the level of achievement that is demonstrated by DHH students it largely influenced by the timing of access to support services. Further the quality of the services and the amount of ready access they have are also contributing factors to their success (Qi & Mitchell, 2011).

When considering the educational impacts for individuals in New Zealand it has been found that the reading and writing levels of deaf children are below the chronological equivalent (Mayer, Yonetani, Hillmer, & Peterson, 2010). Overall, the above studies demonstrate some of the impacts individuals who are DHH are experiencing in educational settings. The current impacts must be addressed. Studies exploring teachers' knowledge of hearing loss contribute to the data to help reduce the impacts of hearing loss observed in the classroom (Coombe, 2018; Lass et al., 1985). The need to examine New Zealand SLTs' knowledge of hearing loss and perspectives on collaboration will provide data to support clinical practice identifying SLTs' learning needs to ensure speech, language and hearing impacts are reduced clinically.

1.10 Adults with hearing loss; impacts on occupation and social outcomes

Adults living with hearing loss experience many challenges that can impact their quality of life. One of the most common challenges faced by an adult with hearing loss is successful communication. This in turn, leads to further challenges in social settings,

affecting relationships. Further, these communication challenges can create difficulties for the individual in the workplace (Cunningham & Tucci, 2017).

As discussed above there are many significant educational impacts that individuals with hearing loss face. It is known that individuals with hearing loss often achieve lower levels of education in comparison to individuals with normal hearing. This has a flow on effect, impacting the rate of employment and income received for individuals with a hearing loss (Cunningham & Tucci, 2017). Research has highlighted that factors contributing to the lower rate of employment and promotion is influenced by the reduced access individuals with hearing loss have to promotional information. Further, the reduced rate of promotion could be linked to the higher, more intensive rates of communication required in the role, or the health and safety required in more mobile positions. The perception of hearing loss in the workplace setting further influences the challenges faced (Baldridge & Kulkarni, 2017).

Other challenges faced by individuals with hearing loss extend to the social context. Social isolation is a prominent consequence of hearing loss, leading to a reduced number of fulfilling relationships. The isolation can be perceived or it can be physical. Previous literature has discussed adults with hearing loss reporting that they experience feelings of isolation and loneliness, regardless of whether they are alone or in a social setting (Heffernan, Habib, & Ferguson, 2019).

The two sections above outline some of the challenges that individuals with hearing loss face. The importance of this literature in relation to the current research topic is noteworthy. Upon considering the professionals that can support an individual overcome the noted barriers, SLTs and audiologists can both contribute significantly. The role of the audiologist would be an initial hearing assessment. The following section discusses the comprehensive test battery implemented during the assessment of hearing loss. Further, the management options and modes of communication existing for individuals with hearing loss

are briefly detailed. Foundation information about assessment and management of hearing loss will support SLTs' with interpretation of audiological assessment data and basic management and troubleshooting of hearing technology.

1.11 Assessment of hearing loss

The assessment of suspected hearing loss is comprehensive. The current test battery allows the audiologist to narrow down site-of-lesion. The test battery entails a case-history, objective and subjective assessments testing each component of the hearing system (Hoth & Baljić, 2017). The case-history, a subjective measure, is often completed at the beginning of an assessment, allowing the client to express their hearing experience. During this time, the individual and communication partner identifies any changes they have noticed with the individual's ability to hear, interact and participate in their daily routines. The background information can be used to support the results obtained during later assessment (Taylor & Mueller, 2017).

Pure tone audiometry (PTA), a gold standard assessment is a subjective measure that is used to determine hearing thresholds, identifying the lowest level at which an individual can detect a tonal stimulus (Hoth & Baljić, 2017; Maclennan-Smith, Swanepoel, & Hall, 2013). PTA can test the functioning of the entire peripheral hearing system (outer, middle and inner ear). The test entails a detailed assessment of threshold across the frequency range, quantifying the amount of frequency-specific hearing loss. Speech discrimination testing is an assessment that contains high face validity. It allows the clinician to understand how the client is discriminating speech sounds, required when identifying a word. Commonly, speech testing is used as a cross-check to determine the reliability of other test results, for example, those obtained during PTA. Speech audiometry is a useful assessment tool, providing insight into the individual's communication abilities rather than only understanding their response to

a tonal stimulus (Hoth & Baljić, 2017; Kreisman, Smart, & John, 2015; Lawson & Peterson, 2011).

Immittance measures of the eardrum and middle ear are methods of objective audiometry. Immittance measures are critical in differential diagnosis, providing information an individual cannot report accurately to the audiologist. Tympanometry is a physiological measure, considering the acoustic admittance of the middle ear (Hoth & Baljić, 2017). It can be used to determine the health of the middle ear and can be beneficial in the identification of any fluid or negative pressure in the middle ear cavity. The assessment is a measure of the ear's ability to transmit sound through to the inner ear structure (Hunter & Sanford, 2015). The acoustic stapedius reflex measurement considers the health of the stapedius muscle and the function of the acoustic reflex neural pathways. The stapedius muscle is a protective mechanism, contracting in response to loud sounds. The testing of acoustic reflexes can be used as a cross-check to behavioural thresholds. Secondly, it can be used as a method to help distinguish between middle ear, cochlear and retrocochlear pathology as it tests the integrity of the hearing system (Feeney & Schairer, 2015).

1.12 Management options

Effective management of hearing loss is essential in supporting one's emotional, psychological and social development. Today, both adults and children who are hearing impaired or profoundly deaf require different levels of support which allow them to succeed in various listening environments (Schauwers et al., 2004).

There are many options available in the management of hearing impairment. For every individual, a hearing aid needs assessment is completed, discussing cosmetic needs, individual goals and style of aid. This allows the best method of management to be provided to the individual (Dreschler & de Ronde-Brons, 2016). Audiological intervention provided to

the paediatric population is continuous for the early and teenage years, ensuring ongoing monitoring of the hearing loss. There are specific hearing devices designed for the paediatric population that can be fitted after a needs discussion with the parent or caregiver. The following sections summarise the management options available.

1.12.1 Hearing aids

Hearing aids can increase the hearing ability of those with hearing loss, through amplifying acoustic sound signal (Gallagher & Woodside, 2018). Conventional hearing aids are a common management approach, where pre-and post-measure tools such as the Client Orientated Scale of Improvement (COSI) goals and the Hearing Handicap Inventory for Adults- short (HHIA-S) can be implemented to understand perceived hearing aid benefit (Cassarly, Matthews, Simpson, & Dubno, 2019; Emerson & Job, 2014).

The range of hearing aid styles extends from behind the ear, in the ear, receiver in the ear and completely in the canal. The vast range of styles ensures that there is a hearing device that can be fitted to the various hearing needs. According to Abrams and Kihm (2015) around nine percent of hearing aid owners are unsatisfied with their hearing aids. It is the role of an audiologist to ensure that hearing aids are fitted well and to counsel the client around realistic expectations to ensure hearing aid adoption is beneficial for the client.

1.12.2 Implantable devices

1.12.2.1 Cochlear implant

The cochlear implant is one of the first neural prosthesis that can be used in substitution of a sensory organ when the normal function of the anatomy is damaged (Macherey & Carlyon, 2014). The cochlear implant stimulates the auditory nerve, which transmits sound signals to the brain for neural processing (Baumann & Nobbe, 2006). The

cochlear implant allows the individual to hear via the production of a crude stimulus that mimics the signals that would be observed in a normal functioning cochlea. It does not restore normal hearing (Dorman & Wilson, 2004).

Cochlear implants have been known to show better outcomes in providing mid to high frequency signals. The tonotopic organisation of the cochlea influences this. High frequencies are produced near the base of the cochlea, where low frequencies are produced near the apex. The frequency to place representation means that the low frequencies are harder to reach with the electrode. Shallower insertion of the electrode array into the basal end of the cochlea can be easier to achieve (for an individual with a high frequency hearing loss), although a deep insertion may improve the performance provided by the implant. The individual's hearing needs and cochlea anatomy will influence the electrode placement (Rask-Andersen et al., 2011).

For the paediatric population, bilateral implantation is available (roughly 23 children per year/ or 46 implants). The child must have a severe-to-profound hearing loss. The specialist will determine whether a unilateral or bilateral fitting is appropriate (Ministry of Health (MoH), 2015). Early implantation has been associated with better speech and language outcomes. Thus, the importance of determining candidacy promptly. The criteria for cochlear implantation for adults in New Zealand is strict. Only limited numbers of individuals (approximately 20 per annum, yearly) will be eligible for unilateral implantation yearly (Ministry of Health (MoH), 2015).

1.12.2.2 Bone Anchored Hearing System (BAHS)

The BAHS is another option suitable for adults and paediatrics, when a conventional air conduction hearing aid does not provided benefit (Hobson et al., 2010). The underlying concept of the BAHS is that the hearing aid can bypass an ear with present impairment or

chronic disease of the external or middle ear system (Schilde, Plontke, & Rahne, 2017; Tjellstrom & Hakansson, 1995). The abutment is a prosthesis that is attached to the implant, which is the external component of the device. The abutment protrudes through the skin, allowing the aid to be clipped on. The implant is located internally, attached to the bone. This then vibrates in unison with the aid and abutment, transmitting signals to the cochlea via bone conduction (House & Kutz Jr, 2007). Conventionally, the BAHS device is used in patients who present with conductive or mixed losses, depending on the origin and pathology observed. The BAHS can be used for a range of type and degrees of hearing loss, but typically the candidate will have no more than a mild to moderate sensory loss (in mixed hearing loss cases) (Snik, Bosman, Mylanus, & Cremers, 2004). For example, patients presenting with otosclerosis, previous middle ear surgery, atresia (no external auditory canal) or a chronic discharging ear are good candidates for this style of device (Hobson et al., 2010).

1.12.3 Medical treatment

Medical treatment is not limited to the above surgical device implantation. Depending on the type of loss and pathology present, some medical treatment may be available. Many children present with otitis media, where fluid is situated behind the TM. A common medical procedure in these cases is the insertion of ventilation tubes, more commonly known as grommets. This allows the middle ear space to drain and air, reducing the conductive component (Cayé-Thomasen et al., 2008; Schang et al., 2014).

In the adult population, a conductive loss such as otosclerosis can be treated via the surgical procedure called stapedectomy in which a prosthesis is implanted, in the middle ear where the stapes ossicle is located (Shine, Rodrigues, Miller, & Packer, 2008). Further, other medical management includes, but is not limited to the removal of a foreign body, repairing damaged ossicles or a TM perforation (Eggermont, 2017).

1.12.4 Assistive Listening Devices (ALD)

Although there are many devices looking to improve sensory input for individuals with hearing loss, there is a range of other devices that can support individuals. For example, remote microphone (RM) systems, television links and Bluetooth capabilities.

The use of RMs can be dated back to their application in the education sector (Boothroyd, 2004). Thibodeau (2010) discusses the use of RM systems in environments with excessive ambient background noise. RM systems work to improve signal to noise ratio by having the speaker use a microphone which streams directly to the receiver that is worn by the listener. One of the benefits, is that it can be used by individuals with normal hearing, with APD as well as individuals that are hard of hearing. This is a critical consideration as it can support young children who are learning the foundations for speech and language development in educational or home contexts (Johnston, John, Kreisman, Hall, & Crandell, 2009).

Technology that allows one to link the television to their hearing aids has been developed. The underlying concept is to stream the television signal directly to the individual with hearing aids. This means the volume isn't increased for others watching at the same time. Further, the advancement in Bluetooth capabilities now allows direct streaming of phone calls to hearing aids, improving the quality of telephone conversations (Smith & Davis, 2014).

1.13 Modes of communication

There are several modes of communication that people choose to adopt. It is essential for people to be able to engage with one another. Whether one communicates verbally or non-verbally, it is a skill they use to perform tasks in their daily routine.

Verbal communication or spoken communication is one common mode of interaction. Verbal communication is an umbrella term that refers to the ability to produce speech orally, through the production of speech phonemes. As discussed earlier, the communication chain includes a physiological level, in which the vocal muscles and speech articulators are engaged to produce a message that has been encoded. The auditory system has an important role within verbal communication. It relies significantly on one's ability to decode auditory information from the surrounding environment (Humes & Bess, 2014).

People can engage in a range of verbal communication. For example, at intrapersonal level. This level of communication occurs when one communicates with one's self. Interpersonal level, in contrast, is when more than one individual communicates a message to the other. Further, communication can occur in a small group or within public conversation. Each form of communication presents with different positives and challenges. People will be comfortable with engaging confidently at different levels (McNaughton et al., 2008; Starble, Hutchins, Favro, Prelock, & Bitner, 2005).

Non-verbal communication in contrast, refers to one's ability to use gesture, mannerisms and emotions to communicate. New Zealand Sign Language (NZSL) is identified as a formal language. Originally NZSL was developed and considered as an 'underground' language. It has developed over time. It is now considered an important part of the education system (Witko, Boyles, Smiler, & McKee, 2017).

Similar to the assistive listening devices discussed above, there are also devices used commonly in the field of speech and language. These are referred to as Augmentative and Alternative Communication (AAC), which allows individuals with complex communication needs to express ideas, opinions and emotions in mainstream settings. They are used to facilitate effective communication (McNaughton & Light, 2013).

Makaton is a language programme that is used to support individuals with complex learning difficulties. It is used by more than 100,000 people across both adult and paediatric populations, a figure relevant to the United Kingdom population. The programme includes a range of signs and symbols which support communication. Makaton is a language system, that was originally designed from British Sign Language. The purpose of the programme is for individuals to use it alongside speech, signing as a specific word is pronounced. It is hoped that it will help support an individual to develop speech (Vinales, 2013).

There are a range of devices or visual aids that can be used to portray a full message, or support how one conveys a message. With the advancement in technology, the range of options available to support communication have expanded. Like hearing aids, a needs assessment is completed to identify the needs of an individual before an AAC device is determined. Recent developments have seen the increase in using devices such as an iPhone or iPad to support communication. McNaughton and Light (2013) discuss the potential benefits that may eventuate with the use of mobile technology. Firstly, they discuss the increased awareness for those who require assistive technology to communicate. It provides more awareness for those with complex communication needs as it is common for individuals throughout society to use a smart device. Further, this increases the social acceptance in a mainstream society. For those where AAC is not a normal part of daily interactions, using a mobile phone increased normalcy for them. Secondly, the willingness for an individual to adopt an assistive technology has increased with the ability to use mainstream devices to connect. It is noted that the use of mobile phones and apps is cheaper than the cost of traditional AAC devices (McNaughton & Light, 2013).

A similar progression is being witnessed in hearing technology, with the ability to connect hearing aids to a mobile device via Bluetooth. Having the ability to change programs and volume of hearing devices by phone reduces the need to touch the device. For some, this

discrete option is preferred and a factor considered in hearing aid adoption (Smith & Davis, 2014). There are several different modes of communication. As an SLT, it is important to be familiar with the various options available for those with complex communication needs. Their role is paramount in supporting the individual and their key communication partner engage in successful conversation.

1.14 Role of significant communication partner

Significant others and key communication partners have many roles in supporting daily conversation and engagement. Hearing loss does not only impact the individual. Discussed earlier, the ICF emphasises a holistic approach when considering the management of hearing loss. Key communication partners have a key role in the management and outcomes for the individual.

Meyer et al. (2014) identified non-audiological factors contributing to hearing aid adoption rates in the adult population. It was found in the study that an individual who had positive support from a significant other were more likely to seek support for their hearing loss. In this scenario, an individual living with a significant other is more likely to engage in regular conversation compared to those who live alone. Again, considering all participation restrictions and activity limitations is important. For the same degree of hearing loss, the factors contributing to hearing aid adoption will differ (Simpson, Matthews, Cassarly, & Dubno, 2019). Further, Simpson et al. (2019) suggests that increased involvement of the communication partner, such as a significant other may result in increased rates of hearing aid adoption and daily usage.

A key communication partner has an important role in supporting an individual with hearing loss. Each individual will have different vital communication partners. These can include, but are not limited to, parents, family members, teachers or colleagues. These key

partners can implement communication strategies that can ensure successful communication via compensation (Beckley, Best, & Beeke, 2017; Simmons-Mackie & Damico, 1997). For example, ensuring that you are facing the individual when speaking allows lip reading and other facial cues such as expression and emotion to be read. Communication is more than just the verbal output (Dinică, 2014). It is critical that the conversation partner is positioned strategically, ensuring they are on the better hearing side for the individual and within an effective listening distance. Further strategies that are beneficial in ensuring successful communication outcomes are reducing background noise and using gesture or written cues, or requesting repeats to provide clarification (Carlsson, Hartelius, & Saldert, 2014).

The above section considers the significant communication partner and their role in supporting an individual with hearing loss. The following sections acknowledge the role of the audiologist and SLT. Further, collaboration between the two professions is discussed.

1.15 Audiology as a profession; role and work settings

The role of a hearing health care professional is broad. Due to the nature of hearing loss, the evaluation and management that is required from the professional is extensive. It must be ensured that they are competent and have sufficient clinical experience. Broadly speaking, the daily duties of an audiologist involve taking a case history, administering audiological assessments, and providing feedback and suggestions on management options (Danermark & Manchaiah, 2017). The paediatric population require extensive follow-up during the first twenty years of life. Continuous monitoring of the hearing loss and progress for the individual and their family is considered (Cole & Flexer, 2019).

Audiologists have many opportunities to specialise in varying work settings. Commonly audiologists are found specialising in medical, paediatric, rehabilitative and educational settings. The place of employment will dictate the population the audiologist

collaborates with. It is expected that audiologists engage in EBP. This ensures that the assessment and management provided to clients is relevant and effective.

An audiologist wears many hats, taking up many roles throughout the journey from diagnosis to rehabilitation. It is expected that the assessment can be completed competently, prioritising clinical data. The health literacy levels of the client must be considered before an analysis of the results it given. Feedback must be discussed with the client in layman's terms before management options are discussed. Counselling a client and their family to understand the severity of the situation is critical (Doak, Doak, & Root, 1985). In the paediatric setting, it is essential to acknowledge that many parents of children with hearing loss will have typical normal hearing. This contributes to the level of experience they have with hearing loss. Counselling in this situation is critical, supporting the parents to make informed decisions (Jackson et al., 2008).

1.16 Role of a speech and language therapist

SLTs are competent and experienced individuals who portray a professional demeanour. SLTs work in a range of settings throughout paediatric and adult populations. SLTs are known to work in a range of settings such as District Health Boards (DHB), special care units, private clinics, Ministry of Education (MoE) and special education. Not only is there a vast range of settings, but the role in which the SLT performs varies greatly. However, not only do SLTs perform independent work, they are often valued members working in a multidisciplinary team (MDT) (Neumeier & Moss, 2014).

In their role, SLTs are responsible for the administration of assessment, diagnosis and management for those with speech or language impairment, social, cognitive communication and swallowing difficulties (Webster & Wood, 1989). Further, an SLT works to help maximise learning and promote social inclusion amongst young individuals who have

learning support needs. The role of an SLT further extends but is not restricted to supporting the family or key communication partners to develop and ensure effective communication skills.

Their role expands and is inclusive of working with people from vulnerable populations such as those in the transgender community, those who have swallowing disorders and individuals with complex communication needs (Creaven & O'Malley-Keighran, 2017). With specialised training an SLT can work alongside many individuals, ensuring appropriate management is provided.

The work of an SLT is challenging to describe in a limited number of words as the role and impact they have on the daily lives of many cannot be undermined. They have a significant role from which many individuals benefit.

1.17 Collaboration with audiologists

Speech-language therapy and audiology are both small professions that entail working with common communication disorders. There is the potential of these various disorders occurring co-morbidly, in which communication is the fundamental foundation of work for both professions. Pascoe, Rogers, and Norman (2013) discuss the mismatch between the two professions and how this implicates clients. The significance of collaboration is important.

APD is a specific pathology in which SLTs and audiologists work together to assess a client. Both professionals have an important role. The audiologist completes a hearing assessment to determine hearing status before the APD test battery is administered by the SLT. It is essential the two clinicians work together to support the management of a case in this scenario. The University of Canterbury Speech and Hearing Clinic is an example of where this service is provided.

Further, no matter what clinical setting or population an SLT or audiologist is practising in, they will encounter individuals experiencing some degree of hearing loss. The importance of understanding the nature and implications the loss has for the individual is essential. Kobylas (2016) notes the significance of the role SLTs, audiologists and deaf educators have on the management of hearing loss.

Inter-professional practice (IPP) is described when individuals from different health care disciplines, work collaboratively in a team setting, to ensure the health care provided to the client is coordinated. Via implementation of IPP, the goals for the individual can be streamlined, improving client outcomes. If each professional is working towards the same goal, this will be reflected in the individual's progress. Working collaboratively in health care allows the client to discuss their health matters with all professionals involved. This ensures they have an active role in the management of their health care. Further, IPP can be discussed in the context of educational settings. Engaging in professional development allows individuals from other professions to upskill and learn information about other professions (Ketcherside, Rhodes, Powelson, Cox, & Parker, 2017).

A multiple case study conducted by Pullon, Morgan, Macdonald, McKinlay, and Gray (2016) focussed on IPP across three general practices in New Zealand. The study design allowed direct observations of the practices to be made, while videoed meetings and policy documents (field notes) were reviewed. The results of the study demonstrate the importance of the built environment, the practice demographic/ location, business models, streamlined goals and the overall team structure and attitude. The findings from this study demonstrate factors that contribute to successful IPP, but the barriers and how these can be overcome must be considered. It is important that health professionals are working to ensure the best health outcomes for their clients. Understanding the barriers of IPP between SLT and audiology services in the context of the New Zealand clinical setting is essential.

Flexer (1999) considers information that families or other professionals should request from an audiologist. It is critical to remember that many families will be new to the concept of hearing loss (Jackson et al., 2008). This discussion highlights the importance of ensuring that an inter-professional relationship is implemented within case management to ensure that essential concepts are explored. This will allow understanding of the nature of a hearing loss and the further impacts it may have. The points raised by Flexer (1999) reinforce the importance of collaboration between professionals and family to support the management of communication disorders. In contrast, Flexer (1999) also discusses important information other professionals can provide to the audiologist to facilitate the hearing assessment. It is essential information is provided to ensure accurate results. The power of collaborating as two professional bodies should not be underestimated, therefore there is a need to examine collaboration between SLT and audiology services in relation to the New Zealand context. (Welling & Ukstins, 2015).

The focus of this study is to determine the knowledge levels of New Zealand based SLTs on hearing loss and perspectives on collaboration with the audiology profession. The following section details previous studies that have been completed, exploring relevant professionals of the MDT such as teachers', special educators and speech-language pathologists (SLP) knowledge of hearing loss.

1.18 Members of the multidisciplinary team; knowledge of hearing loss

The understanding of hearing loss and management options has developed significantly over recent years. The range of literature to support this development is noteworthy. There have been many studies exploring various professions' knowledge of hearing loss and further learning needs (Kobylas, 2016; Lass et al., 1985; Lass et al., 1990; Lass et al., 1989; McShea, Fulton, & Hayes, 2016). These studies have been completed

overseas, considering various health professions practising in different clinical settings across the United States of America.

Unfortunately, there is no current data recorded on SLTs practising in New Zealand and their knowledge of hearing loss. Further, there is limited recognition of their perspectives on collaboration with the audiology profession, therefore identifying this in the New Zealand context is essential. Currently, three out of the four professional speech therapy courses in New Zealand contain an introductory course on audiology relevant to speech therapy. It is assumed training SLTs are exposed to hearing related content during their studies. Although other professionals are exposed to hearing related content, the discussion below analyses the current literature, outlining the need for data understanding New Zealand SLTs' current knowledge and perspective on hearing and audiology services.

Lass et al. (1985) surveyed seventy-seven special educators in the school setting to understand their knowledge and exposure to hearing loss. The results were compared to ninety-eight primary school teachers who were also recruited for the study. A 25-item questionnaire inclusive of questions regarding hearing loss, prevalence, etiology, hearing devices and the assessment and prevention of hearing loss were included. The respondents were required to provide their answers in true and false format. The study found that special educators who had participated in more specified training demonstrated a better knowledge of hearing loss. Although discrepancies were small, the study demonstrated that there are different levels of knowledge across professional bodies who are exposed to children with hearing loss. It was discussed that SLPs and audiologists could meet with teachers and special educators to consult and discuss individuals with hearing loss and the long-term outcomes this may have for those individuals. This would support improved understanding, ensuring best practice is provided. The study also identified many aspects in which further professional development could be provided for both teachers and special educators, for

example, the assessment of hearing loss in children of different ages and the general principles of aural rehabilitation.

Lass et al. (1989) later developed a questionnaire to understand SLPs' knowledge of, exposure to, and attitudes toward hearing aids and hearing aid wearers. A questionnaire was developed with questions exploring components of hearing aids, classroom and clinical practicum exposure to hearing aids and demographics and attitudes towards hearing aids. Overall, eighty-eight participants responded to the questionnaire. Results showed that the population of SLPs that were surveyed did somewhat better than classroom teachers and special educators that were previously surveyed in 1986 and 1987.

The areas highlighted for future learning suggest that more formal coursework would be beneficial in reducing these deficiencies around evaluation and management of those who wear hearing aids. Overall, 81.8% of participants noted that more training would be appropriate to increase knowledge of hearing aids. The areas identified for future professional development, such as hearing aids, will ensure that effectiveness of services will increase. Results noted that almost half of the participants had less than five hours of teaching on hearing aids, while 11.4% had no training at all. Through the implementation of this training, it will allow SLPs to facilitate better management ensuring effective communication and learning processes for clients with hearing loss.

Lass et al. (1990) further explored health educators' knowledge of hearing loss and the associated health practices. The population of health educators were responsible for administering programmes for students regarding hearing health practices as a part of the curriculum across six American states. Again, this study was completed via the development and administration of a questionnaire that was completed by eighty-nine health educators. The questionnaire was inclusive of questions in the format of multiple choice, yes or no, fill

in the blank and true or false. The questions ranged from exploring their knowledge of the normal hearing mechanism, causes of hearing loss and the influence of noise on hearing.

Although specific outcome measures were not addressed, a summary of the results suggested that there are gaps in knowledge that would prove beneficial if addressed. Lass et al. (1990) highlighted that further training on the normal auditory mechanism, types of hearing loss and the effect of noise on hearing would be beneficial, as these were identified as components of hearing loss that were misunderstood by the focus population.

Kobylas (2016) examined ninety-five SLPs based in school settings in Michigan and Ohio, and their knowledge of hearing technology. One important finding from this study is that in a school setting, it is likely for SLPs to come across a student with some degree of hearing loss. As noted above, the importance and success of the UNHSEIP has played a role in those who chose to adopt a method of hearing intervention in childhood, therefore, increasing the number of individuals with hearing devices in the school setting (Yoshinaga-Itano et al., 2000).

Overall the study by Kobylas (2016) found that many SLPs in the school setting do not feel prepared to work with children with a hearing loss and are often not equipped with the resources to ensure that they can perform tasks, such as battery changes and basic troubleshooting with hearing technology. The tasks included within the study were those that are essential in ensuring the hearing devices are working correctly. These could impact the effectiveness of the services that are provided, if an individual's hearing aids or cochlear implant is not working then the SLP cannot provide effective management or carry out assessment. Hearing technology and aural rehabilitation were identified as areas where SLTs could benefit with additional training. Further, many of the SLPs noted that they do not have contact with an educational audiologist. Kobylas (2016) identified a limitation of this study. It is noted that the population recruited for this study did not provide a national perspective,

only limited to the recruitment process and membership requirements for the states of Michigan and Ohio.

Previous research conducted by Coombe (2018) explores the knowledge of primary school teachers' and their knowledge of hearing impairment and deafness in New Zealand. The study found that there were many aspects of hearing loss and management that required further professional development. One of the topics identified was learning support strategies for students with hearing devices. The study contributed significantly to the newly and ongoing development of online modules by the Deaf Education Centres (DECs) in New Zealand, where hearing aids functioning and troubleshooting are module topics. This data has contributed to the body of literature significantly, as children communicate in many settings daily. It is critical that all key communication partners have an understanding of an individual's needs and the best way to provide management.

McShea et al. (2016), through conducting interviews, found that paid support care workers ($N = 20$) had difficulty recognising hearing loss across individuals that they support who had co-morbid disorders. It was found that the more complex the needs of the individual, the more the hearing loss was overlooked. Although the knowledge of the population of interest is not explored across these studies, it is important to determine individual ability to recognise and manage communication breakdowns caused by hearing loss. McShea et al. (2016) noted that hearing loss can be suspected, but the impact it can have for an individual is often underestimated or misunderstood. Again, this information has resulted in the recommendation of further professional development, where hearing aids is one notable topic. The concept of direct contact hours alone is not enough to support understanding. Theoretical professional development could also be beneficial.

Limitations of the McShea et al (2016) study included the brief information about the study before the interview was conducted. It was queried whether individuals changed their

responses impacting the reliability and truth that was provided from their answers. However, it was noted that although they had information about the study's topic, the answers still reported a lack in understanding, suggesting the data collected was genuine. A second noteworthy limitation was the lack of variation in the type of facility visited. For individuals with complex needs, the ability to distinguish hearing loss from co-morbid disorders is challenging. McShea et al. (2016) discussed whether the inclusion of more facilities where residents were more independent would have been beneficial.

The current literature highlights that many professions recognise that more training around the normal hearing mechanism, hearing loss and hearing management would be beneficial. Exploring this in relation to the New Zealand context will be beneficial. Thus, the study rationale and aims are detailed below.

1.19 Study rationale

The above discussion of the literature prompts a question about the knowledge of New Zealand-based SLTs on hearing loss. Further, the current literature has limited information on speech language therapists' current perspective on the collaboration between SLTs and audiologists. Examination of these topics could contribute to more successful outcomes for clients in both the speech therapy and audiology contexts.

1.20 Aims and Research Questions

The aim of this study is to determine what knowledge SLTs in New Zealand have about hearing loss and the impact it can have on the development of speech and language. Further, the study seeks to understand SLTs' perspective on collaboration with audiologists; identifying components of hearing loss; and where future professional development would be beneficial. Developing understanding of these needs will identify the current resources being

used and highlight where further information is required. With these aims in mind, the study addressed the following three research questions:

1. What knowledge do speech language therapists have about hearing/ hearing loss?
2. What are speech language therapists' experiences and perspectives on collaborating with audiologists?
3. What professional development opportunities and further information about hearing loss do speech-language therapists' want to support their work?

2 Method

2.1 Research Ethics

The project was approved by the University of Canterbury Human Ethics Committee on the 14th of November 2019 (Ref: HEC 2019/28/LR Amendment 2). See Appendix A.

2.2 Participants

The target group of participants included in the current study are SLTs who are currently practising in New Zealand. Participants were recruited via an email sent to all members of the New Zealand Speech-language Therapists' Association (NZSTA) and via an online Facebook post that was provided by the NZSTA in an attempt to include SLTs who do not have a current NZSTA membership[1]. Important information about the study and participant consent were included at the beginning of the online survey. Participant recruitment occurred over a ten-week period. One reminder email / post was used with the intention of increasing response rates. Participants were provided the option of entering the draw for one of ten $NZD20 fuel vouchers on completion of the survey.

2.3 Instruments

The questionnaire was developed based on instruments used in previous research by Lass et al. (1985) (1989) (1990), Coombe (2018) and Kobylas (2016). These instruments were designed to gain understanding of teachers', special educators' and SLPs' knowledge of hearing impairment, hearing aids and hearing health practices. Further, their exposure to hearing loss was also explored. The five instruments were used as sources for the

[1] Speech-language therapy in New Zealand is not a registered profession under the Health Practitioners Competency Assurance Act. It is also not compulsory for practising SLTs to be members of the NZSTA. Therefore, there is no comprehensive central registry of practising SLTs in New Zealand.

development of the current questionnaire. Previous questions were included or adapted to fit the current study aims. The following are examples from the above instruments, included in the current questionnaire:

- *In your opinion, the main consequence/s of hearing impairment are? (multiple choice- 7 options).*
- *People who have a hearing loss for high-pitched sounds often can hear speech, but have difficulty understanding it (true or false).*

2.3.1 Questionnaire pilot

A draft questionnaire was prepared and reviewed by two experienced SLTs and two audiologists. The purpose of piloting the questionnaire was to ensure the relevance of questions to the current clinical settings. Following the feedback, amendments were made to the final questionnaire. The following are examples of changes made to the questionnaire:

- *Adding in an image to support the different forms of devices before asking "what devices have they had experience with?".*
- *The addition of the question regarding the comfort of participants completing a device check before a session.*
- *Changing the terminology "FM system" to the term "remote microphone assistive devices".*
- *The insertion of explanations before a series of questions, such as "the following questions are to gauge your knowledge and understanding of normal hearing anatomy, types of hearing loss and audiological assessment. Please answer honestly".*

2.3.2 Final questionnaire

Feedback from these reviewers was integrated into the final 48 item questionnaire that was developed and distributed using the Qualtrics Platform software (2019). The final questionnaire included three sections which contained between 13 and 18 separate questions (see Appendix B). The questionnaire included a range of questions relevant to the knowledge of hearing loss. Specifically, the questions were inclusive of anatomy, aetiology and hearing assessment. Further, the perspective of collaboration between SLTs and audiologists was explored through questions concerning personal experiences of collaboration between the two professions, the understanding of the role of an audiologist and sources where information about hearing loss is gathered. The following questions are examples from each section of the final questionnaire:

- Demographics
    - *What hearing devices/ accessories have you had experience with? (select all that apply) (multiple choice- 5 options).*
- Knowledge of hearing loss, assessment and hearing devices
    - *Otitis media can cause the following (tick all that apply) (multiple choice- 5 options).*
- Perspectives on collaboration
    - *Describe an experience where you have collaborated directly with an audiologist: (short-answer).*
        - *During this experience, what worked well? (short-answer).*
        - *In relation to the above experience, what didn't work well? (short-answer).*

2.4 Measures

The question formats in the questionnaire included multiple choice and five-point Likert-type scale format. Short answer and relevant demographic questions were also included. Each question had relevant answers provided for selection, or space to fill in an answer that participants thought to be appropriate. Where an "others" option was thought to be relevant, this was provided for the participant, to fill out text answers as necessary. It was noted that the researcher may not have thought of all answers that may be considered by participants.

The questionnaire included three sections inclusive of demographic information, obtaining details of the level of study, employment setting and years of work within the chosen field. The second section explored the participants' knowledge of hearing loss, normal hearing anatomy and audiological assessment. The final section included questions relevant to perspectives on collaboration with audiologists, specifically discussing individual experiences of collaboration.

Data analysis for the questionnaire was completed using Excel 2017, version 15.30. Descriptive statistics and considering responses over number of participants to gain percentages was the chosen method implemented to analyse the data.

Further data was collected via the implementation of semi-structured interviewing. This method was chosen to seek extra information about SLTs' perspective and experience on working with individuals who are hard of hearing, and their collaboration with the audiology profession. The chosen methodology allowed the researcher to achieve a more in depth understanding of the current clinical perspective. This section of the questionnaire highlighted many themes that contributed to the selected interview questions. It was

identified that further information about collaboration between the two professions would be beneficial in understanding this in relation to the New Zealand context.

2.5 Semi-structured interviews

2.5.1 Participants

The target group of participants for this component of the thesis remained SLTs' who were currently practising in New Zealand. The participants were recruited via the provision of the interview advertisement which was distributed to a range of clinical work places (e.g., District Health Boards and Special schools). Individuals who were interested in participating in the study then contacted the researcher directly to obtain further information. Upon receiving the information sheet, participants confirmed their willingness to participate. A suitable interview time was arranged. Participants were offered a $NZD20 fuel voucher to acknowledge their contribution to the study.

Four SLTs were interviewed during this phase of the study. Of the four participants, two were working in the public health system, one participant worked in special education and one participant worked in the deaf education field. Work experience of the four participants spanned between two to seven years. Upon meeting the participant, study information was reviewed and a consent form was provided. The form was signed and handed to the researcher prior to the interview commencing.

2.5.2 Data collection

Each participant engaged in one semi-structured interview. The participant chose the location in which the interview was held. Interviews were conducted at a range of locations such as cafes and workplace offices. The interview lasted between half an hour and one hour. During the interview, the researcher used a series of set questions which were developed

from questionnaire responses (see Appendix C for list of questions). Where further conversation and discussion areas occurred, follow-up questions were used. For example, *"could you tell me more about that?"* and *"do you have any further comments on that?"* were questions implemented to gain more detail on a topic. Using key questions ensured flow during the interview and allowed the researcher to ensure responses remained relevant, while still providing the flexibility to explore further areas in an unstructured manner.

The interviews were audio recorded on a hand-held Olympus digital voice recorder VN-732PC device and an apple iPhone 8+ as a back-up recording device. After the interview, the recording was transcribed by hand. The full transcription was then returned to the participant with a request to review the accuracy of the transcript and to offer the opportunity to delete, revise or add information. This process was implemented to ensure the collected data was accurate prior to the final analysis. All participants chose to retain the transcriptions as presented.

2.5.3 Data Analysis

The completion of the interviews contributed to the foundation of the qualitative data that was analysed. Thematic analysis was the chosen method implemented to understand the data. Key themes were identified throughout each individual interview before cross examining the themes against the remaining three interviews.

The researcher completed the transcription after the conclusion of the interview. This process allowed the researcher to familiarise them self with the data at surface level. Reading and re-reading the transcribed interviews ensured the researcher was familiar with the depth of the data. The next stage involved the generation of initial themes. This process involved developing codes, as patterns were identified in the transcription. The researcher completed the revision of the four coded interviews. This step allowed the researcher to add any codes

that were initially missed and to further familiarise themselves with the transcriptions. The codes were defined and sorted into broader headings of themes. The themes were further refined, determining whether patterns initially identified were supported by the data as a main theme or a sub-theme. Those that were not supported by the data were removed (Clarke & Braun, 2018).

The final step in the process included labelling the themes with names. This ensured the researcher understood the data that encompassed each theme, ensuring the theme could be explained with quotations as a narrative. The researcher selected quotations from the interview transcriptions to use in the results discussion, relevant to the selected themes. This method allowed the researcher to consider similarities but also the unique differences between the participants' experiences (Clarke & Braun, 2018).

The transcriptions and identified themes and sub-themes were discussed with the primary academic supervisor to ensure the chosen themes were relevant to the current study. Via undertaking this process, the themes discussed in the following section of this thesis are accurate and relevant. Upon completion of this process, the results chapter was produced.

3 Results

3.1 Questionnaire

The questionnaire responses were analysed using Excel 2017, version 15.30. During the ten-week data collection period a total of 32 participants completed the questionnaire. Of the submitted questionnaires, 7 were incomplete or partially completed, thus excluded from data analysis. The remaining 25 responses, each with 48 complete questions, were analysed. Some questions allowed participants to indicate more than one correct answer. Therefore, in some instances the total number of responses exceed the number of participants.

3.2 Participant demographics

Almost half of the participants (44%, *N* = 11) identified as being between the ages of twenty to twenty-nine years of age, while the remaining participants were aged between 30 to 69 years of age (56%, *N* = 14).

Of the current participants, 64% *(N* = 16*)* gained their professional Speech and Language degree in New Zealand. Further, 16% *(N* = 4*)* obtained their qualification in the United Kingdom. Participants were provided with an 'other' option. Other participants noted that they obtained their qualification in the United States of America (8%, *N* = 2) and in South Africa (12%, *N* = 3).

Of the current population, 76% (*N* = 19*)* completed their studies at the Bachelor level, with one participant gaining their qualification at PhD level. Almost half of the participants (44%, *N* = 11) reported that they have had more than ten year's work experience as an SLT. In contrast, it was reported that several participants are currently in their first two years of work experience (32%, *N* = 8). The remaining participants reported 3 to 9 years' experience (24%, *N* = 6). The following table outlines the workplace settings the participants are currently practising.

Table 1: *Participant workplace settings*

	N	*%*
Hospital/ DHB	6	24%
Private Clinic	5	20%
Ministry of Education	6	24%
Special School	6	24%
Other (please describe)	5	20%

Note: Participants were able to select multiple answers for this question.

Other responses included community services, early intervention service, behaviour support, Talk Link and private rehabilitation companies.

Experience with hearing loss and hearing devices

Across the various contexts, 80% (*N* = 20) participants reported working with clients with hearing loss, while 18% (*N* = 4) reported having no individuals on their case load with a hearing loss. One participant (4%) did not know whether any of their clients had a hearing loss. Of the 80% *(N* = 20), 62% *(N* =13) reported working with 5 or more individuals with a known loss. The remaining 38% had less than 5 individuals with a hearing loss on their current case load. The following table demonstrates the age groups of clients with hearing loss that the participants are working with.

Table 2: *Age groups of clients with hearing loss*

	N	*%*
0-5 years	15	60%
6-15 years	13	52%
16-25 years	7	28%
26-50 years	4	16%
50+ years	6	24%

Note: Participants were able to select more than one answer.

Further data collated, explored the number of these individuals who are currently fitted with a hearing device. Of the 80% (N = 20) of participants working with an individual with hearing loss, all were fitted with some form of hearing device. The following table outlines a range of common hearing devices and assistive technology that the SLTs identified being exposed to, during their individual work experience.

Table 3: *Hearing devices and accessories that the participants have had experience with throughout their work experience*

	N	*%*
Hearing aids	25	100%
Cochlear implants	17	68%
Bone conduction hearing aids	15	60%
Remote microphone assistive devices	20	80%
Other	1	4%

Note: Participants could select more than one response for this question. 'Other' device included an auditory brainstem implant.

Every participant included reported having experience with a standard hearing aid (100%, N = 25). Further responses highlighted that remote microphone technology (80%, N

= 20) was the second most common form of hearing device or accessory participants were exposed to.

Of the participants who have clients on their current case load with hearing devices, half of these participants (50%, *N* = 10) identified that they were working with five or more clients with some form of device. Multiple answers were allowed for the above question, suggesting that some SLTs may be working with clients who have varying devices and/ or accessories.

Question 15 asked how comfortable respondents would be performing a device check before the beginning of their speech therapy sessions. Over half of the participants recognised that they would not feel comfortable (28%, *N* = 7) or may only feel comfortable checking the device sometimes (40%, *N* = 10). Participants were asked to provide rationale for their answers. Participants reported that they would be able to *'check the device, but would not know how to troubleshoot if it was not working'* and some noted that *'it depends on the device'*. Further, several participants noted that they *'would not know how to do this'*. In contrast, some participants identified that they have been trained to perform device checks.

Almost half of the participants (48%, *N* = 12) identified that they are making between one and five referrals to audiology in a year, while a small number of participants (12%, *N* = 3) are making more than 10 and, *N* = 8 participants noted that they are not making any.

When asked how comfortable the participants were with the referral pathway to audiology services out of five stars (Likert-type scale where one star = not comfortable and five stars = very comfortable), the participants responded (*M* = 3.20*, SD* = 1.50) with a range of 1 to 5 stars. The data had no significant skewness or kurtosis.

Speech therapist education on hearing loss

All participants (100%, *N* = 25) identified that they have completed a University-based course that had specific content about hearing and/ or hearing-related disorders. The majority of the participants (76%, *N* = 19), participated in a full course while a small number (24%, *N* = 6) identified that the content was embedded within another course's content.

When asked to provide any other relevant information that could be recalled such as the name or focus for the course, participants reported that they engaged in a semester long paper as a part of their academic study. The courses included content on *'aural rehabilitation', 'hearing and acoustics'* and an *'introductory course'.*

3.3 Knowledge of hearing loss

Consequences of hearing loss

SLTs involved in the study were asked what the main consequence(s) of hearing loss were in their own opinion from a list of seven statements. The following table outlines the responses.

Table 4: *Participant opinions of the main consequence/s of hearing impairment*

	N	*%*
A feeling of isolation	16	64%
A feeling of insecurity	8	32%
A loss of the primary warning systems	12	48%
Loss of feeling that you are part of a living, alive world	10	40%
Loss of ability to talk freely with others	16	64%
Loss of ability to hear others talk	19	76%
Other (please describe)	4	16%

Note: Participants could select more than one response for this question.

'Loss of ability to hear others talk' (76%, *N* = 19) was the most common response selected by participants. Further, the *'feeling of isolation'* and *'loss of ability to talk freely with others'* were also identified as a consequence of hearing loss by several participants (64%, *N* = 16). A text option was provided so participants could respond with consequences of hearing loss that were not listed. *'Language deprivation'* and *'impacts on language and literacy development'* were further identified as 'negative' consequences of hearing loss. Positive consequences of hearing loss were also provided through this text option. The response included *'a strong sense of identity and inclusion in Deaf community'* and *'an opportunity to explore identity and experience Deaf culture and community'*.

Upon consideration of the consequences of hearing loss, participants were asked to rate their awareness of the risk factors for both *'adults'* and *'paediatrics'*. When considering the adult risk factors for hearing loss, the results were normally distributed (*M* = 3.64, *SD* = 1.19), with a range of 1 to 5 stars (1 star = unaware and 5 stars = aware). There was no significant skewness or kurtosis. Results for the paediatric risk factors were similar. The results were normally distributed (*M* = 3.60, *SD* = 1.12), with no significant skewness or kurtosis.

Knowledge of hearing anatomy and types of hearing loss

When asked the anatomical name for the *'organ of hearing'* *N* = 24 (96%) identified this correctly as the *'cochlea'*. All participants (100%) could identify that presbycusis is the official term used to describe an individual with aging hearing.

Participants were asked a hypothetical scenario about a person with hearing loss. The question noted that *'people who have a hearing loss for high-pitched sounds often can hear speech, but have difficulty understanding it, true or false'*. *N* = 19 (76%) identified that this statement is true.

Question 27 demonstrates the participants understanding of the impacts of otitis media. The table displays the responses provided.

Table 5: *Impacts of otitis media (OM)*

	N	*%*
Infection	24	96%
Loss of hearing	20	80%
Abnormal ear canal	5	20%
Pain in the ear	23	92%
Long term damage to the auditory system	16	64%

Note: Participants could select more than one response for this question.

The two most common responses provided by participants is the *'pain in the ear'* and *'infection'*. Question 28 asked the type of hearing losses that OM contributes. Participants could select from the options *'sensorineural hearing loss', 'conductive hearing loss'* and *'mixed hearing loss'* (more than one response could be selected by participants). Conductive hearing loss was the highest selected response (96%, $N = 24$) and mixed hearing loss was additionally selected by participants.

The same response options were provided to participants when asked which type of hearing loss is associated with fluctuating hearing loss. Again, conductive hearing loss was the most prominent response (76%, $N = 19$). Half of the participants (52%, $N = 13$) selected mixed hearing loss as a cause for fluctuating hearing loss.

Finally, the participants were asked *'which of the following are associated with permanent hearing loss?'*. Every participant (100%) selected sensorineural hearing loss. Again, almost half (48%) of the participant sample selected mixed hearing loss as a contributor to a permanent loss. Two participants (8%) were also successful in identifying that there are conductive hearing losses of a permanent nature.

Knowledge of audiological assessment

Question 23, required participants to match a hearing assessment to the appropriate age range that the test is used. When asked, what age group the auditory brainstem response (ABR) was typically used, almost all (92*%, N* = 23) of the participants reported that it was used for the age group between zero and six months of age (although this assessment can be used to assess hearing at any age).

Visual reinforcement audiometry (VRA) is typically used to assess children between the ages of six to thirty months. When asked, less than half (36%, *N* = 9) of participants identified this age group, with over half (56%, *N* = 14) of participants selecting that it is typically used for individuals between thirty months to five years.

Play audiometry is typically used for the thirty month to five-year age group. Roughly half of the participants responded correctly. Participants were further asked to identify the main aim of play audiometry *N* = 22 (88%) of participants could identify that is an assessment used to *'measure a hearing threshold at varying sound frequencies'.*

The final assessment participants were asked to match to the appropriate age range was standard PTA. Most participants (84%, *N* = 21*)* selected that it is used for individuals typically over five years of age.

The final question about audiological assessment focused on an assessment used regularly in clinical practice, distortion product otoacoustic emissions. Participants were asked to identify which part of the hearing system the assessment is used to test. *N* = 8 (32%) of participants could identify that it is used to assess cochlear function. The remaining participants were unable to identify the correct component of the hearing system.

Knowledge hearing technology benefits

Two questions explored participant understanding of hearing technology benefits. When asked if *'anyone with a hearing loss can benefit from a hearing aid, true or false'* nearly all of the participant sample selected the option 'false' (80%, *N* = 20), while only *N* = 5, selected the response 'true'.

Participants provided rationale for their answer. Common responses discussed the severity of loss and how that would impact hearing aid benefit (32%, *N* = 8). The term '*profound hearing loss'* was a response that re-occurred, where participants identified that people with a hearing loss of this degree would not benefit from a conventional hearing device. Further, participants also identified that individuals with a middle ear component may require a different type of hearing device, influencing the benefit.

The second question *'if a client is wearing hearing aids, are they capable of hearing within the normal range?'* (yes or no response) 64% (*N* = 16) responded no, while the remaining participants selected yes (36%, *N* = 9). Again, participants were asked to provide rationale for their responses. Similar to the first question, a common theme amongst responses referred to the severity of the loss. One participant responded with *"some people can only experience partial gains even with amplification. It is an improvement but not to 20 dB for all frequencies"* while *N* = 4 (16%) participants identified that it *"depends on the extent and type of hearing loss"*.

3.4 Perspective on collaboration

Understanding of audiologists role

Participants were asked to describe their *understanding of an audiologist's role in supporting an individual with hearing loss.* Two themes were identified from this question*, 'clinical responsibilities'* and *'education and counselling'.* Within the two key themes,

further sub-themes were identified. Clinical responsibilities encompassed the *'role in assessment', 'providing recommendations'* and *'follow-up/ further referrals'*. Education and counselling comprised the sub-themes *'family support and education about hearing loss'* and *'device management'*. The themes are discussed in more detail below.

Clinical responsibilities

This theme encompasses the clinical duties that audiologists are required to carry out with their clients daily. Participants have provided responses, portraying their understanding of the tasks audiologists implement and the role they perform within.

(a) Role in assessment: All participants reported the significance of assessment when discussing their understanding of an audiologist's role. The importance of assessment was acknowledged as it guides further management. For example, participants noted that the role of the audiologist is *'to comprehensively assess and diagnose a client's hearing'* and to complete a *'full comprehensive assessment'*. Another participant noted *'the audiologists role is to provide information about a client's hearing loss i.e. extent of loss, cause of loss etc, based on hearing tests'*. Further one participant highlighted the importance of providing accurate information, *'providing accurate information about what the client can hear with and without hearing devices.'*

(b) Providing recommendations: Almost all of the participants discussed the role audiologists fulfil in regards to the provision of hearing devices, to support a client with hearing loss. They noted that part of the audiologist's role is *'to determine which hearing aid is suitable and provide the hearing aid as well as support the client on how to operate and wear it'* and to *'provide equipment and advice on how to use it*

appropriately'. One participant alluded to the importance of supporting the family to make these decisions, '*support the client and family to make decisions about device'*.

(c) Follow-up/ further referrals: Nine participants (36%) identified follow-up and further referrals being a part of an audiologist's role. This was a significant component of the current theme as it emphasises the ongoing input that audiologists have with their clients. The participants noted that the audiologist should be '*reviewing cases regularly'* and *'monitoring progress with wear time'*.

Education and counselling about hearing loss

(a) Family support and education about hearing loss: It was acknowledged by eight participants (32%) that hearing loss also impacts the family members and other members involved in a MDT. It was noted that *'they provide advice and education to teachers, parents and rest homes etc'* and have an important role in *'liaising with other health professionals on the implications of a hearing impairment on patient's quality of life'*. Further participants noted that the audiologist's role is *'supporting clients and families to understand the impact of deafness on communication and wellbeing'* and *'to support them to reduce the risks of further hearing damage'*. One participant identified that the audiologist is responsible for *'education about the likely side-effects and impacts for patients/ whanau'*.

(b) Device management: The management of hearing devices is encompassed through both educating and counselling the individual and family member with the hearing loss. One participant specifically noted the importance of device management being included as a part of the education and counselling process implementing *'regular*

follow-ups and reviews and training/ support caregivers on how to use device/ support hearing".

Experience of collaboration with audiology services

Question 40 explored experiences where participants '*have collaborated directly with an audiologist'.* Many participants identified that they have not had the opportunity to collaborate directly with audiology services. Rather, it was identified that SLTs were having contact via *'referrals', 'requesting reports'* and on some occasions through a *'phone call'.*

Participants were asked to discuss '*what worked well'* and '*things that didn't work well'* in relation to the chosen experience. On report of *'what worked well',* participants discussed the benefit in obtaining *'a copy of the final report or audiogram'*. Examples of the audiologist *'working well in teams', 'being approachable'* and *'being informative'* were further responses that participants expressed being valuable in ensuring successful collaboration.

On consideration of what *'did not work well',* participants reported contrasting experiences. More than one participant noted that in their experience they found it *'very hard to know who the audiologist was'* or identifying the *'key person the audiologist is working with'.* Participants also discussed examples where the work place setting contributed to the limited amount of collaboration. For example, participants working in *'acute based settings'* found that the presence and role of SLTs versus audiologist was different. Finally, many SLTs acknowledged the size of waitlists and the impacts this has on the *'referral process'.*

Upon considering personal collaboration experiences with audiology services, participants were further asked when their last contact with an audiologist was. The five-answer multiple choice question revealed that only some participants have had contact with an audiologist within the last week (24%, $N = 6$). A portion of the remaining participants

(32%, *N* = 8) have not had contact with an audiologist in the past three months. To further understand the perspective of collaboration, participants were asked to rate on a five-point Likert scale, ranging between 1 and 5 (1 star = not important and 5 stars = very important) *'how important they feel 'good communication' between speech therapy and audiology services is'.* Results suggest that SLTs believe good communication is important (*M* = 4.68, *SD* = 0.48) suggesting that good communication is important. The data showed no significant skewness or kurtosis.

3.5 Further information

Information sharing/ case discussion/ multi-disciplinary team

Two questions aimed to explore different aspects of audiology where further information would support management plans and the sources the participants utilise currently to find out this information.

Participants identified areas of audiology that they would find further education or information beneficial. Of the six-multiple choice responses, information about communication strategies for children with hearing aids (80%, *N* = 20) and information about how to trouble shoot hearing aids (76%, *N* = 19) were the most common responses. A text entry 'other' response box was also provided to participants. 'Other' responses included *'who to contact if things go wrong…model of support that should be in place for students with cochlear implants'* and *'information about wider consequences for example, long-term implications of language and speech development'.* The following table outlines the responses obtained.

Table 6: *Components of audiology where speech therapists' have identified further education or information would be beneficial*

	N	*%*
Information about the ear and hearing system	13	52%
Information about how hearing aids work	15	60%
Information about how to trouble shoot hearing aids	19	76%
Information about how implantable devices work	12	48%
Information about communication strategies for children with hearing aids	20	80%
Information about communication support strategies for adults with hearing aids	10	40%
Other (please describe)	2	8%

Note: Participants could select more than one response for this question

The second question aimed to determine what resources participants are currently utilising to find out the information identified above. The table below displays the obtained results.

Table 7: *Resources utilised by participants to find hearing related information*

	N	*%*
New Zealand Audiology Society (NZAS) website	11	44%
Kelston/ van Asch Deaf education Centre websites	16	64%
Google (or other search engines) search using key words	18	72%
Refer to a textbook	7	28%
Other (please describe)	9	36%

Note: Participants could select more than one response.

'Other' responses were provided in text format. Many participants (36%, $N = 9$) noted that they will consult with another person such as colleagues, family members or another professional such as an Advisor on Deaf Children (AoDC) (8%, $N = 2$) for further information. Other participants reported having a family member with hearing loss or hearing aids, so they have used this opportunity to learn and develop skills for clients on their case load.

Professional development

Participants were provided six different areas of audiology and asked whether they *'feel that they have received "appropriate training" in the following areas?'*. This question was used to then determine whether participants *'feel that training as a SLT in the following areas in necessary?'*. The question was used to explore further areas that may be relevant for future professional development. The following table outlines the results from the 5-point Likert type scale, where individuals rated whether they strongly agreed through to strongly disagreed with training in the specific areas of audiology.

Table 8: *Participant responses: Do you feel that you have received appropriate training in the chosen areas?*

	Strongly agree (1)	*Agree (2)*	*Neither agree nor disagree (3)*	*Disagree (4)*	*Strongly Disagree (5)*	*Mean*	*Standard deviation*
Diagnostic audiology	12% (*N* = 3)	32% (*N* = 8)	24% (*N* = 6)	28% (*N* = 7)	4% (*N* = 1)	2.80	1.12
Aural/ auditory rehabilitation	12% (*N* = 3)	20% (*N* = 5)	12% (*N* = 3)	40% (*N* = 10)	16% (*N* = 4)	3.28	1.31
Hearing aids	12% (*N* = 3)	40% (*N* = 10)	12% (*N* = 3)	32% (*N* = 8)	4% (*N* = 1)	2.76	1.17
Cochlear implants	8% (*N* = 2)	32% (*N* = 8)	20% (*N* = 5)	32% (*N* = 8)	8% (*N* = 2)	3	1.16
Remote microphone assistive devices	8% (*N* = 2)	28% (*N* = 7)	24% (*N* = 6)	36% (*N* = 9)	4% (*N* = 1)	3	1.08
Understanding how the degree of hearing loss impacts speech?	32% (*N* = 8)	48% (*N* = 12)	8% (*N* = 2)	12% (*N* = 3)	0.0% (*N* = 0)	2	0.96

A comment section was provided for additional comments in relation to the above question. Many of the responses discussed the importance of using the information every day. Some participants noted that they felt they received good training in these areas at the time of their education, *'but without continuous use, it is easy to forget'*. Participants noted that their training is not *'up to date'*. The following table outlines the results when participants were asked whether they felt that training in these areas was necessary.

Table 9*: Participant responses: Is training in these areas necessary for speech therapists?*

	Strongly agree (1)	*Agree (2)*	*Neither agree nor disagree (3)*	*Disagree (4)*	*Strongly Disagree (5)*	*Mean*	*Standard deviation*
Diagnostic audiology	16% (*N* = 4)	64% (*N* = 16)	16% (*N* = 4)	4% (*N* = 1)	0.0% (*N* = 0)	2.08	0.70
Aural/ auditory rehabilitation	36% (*N* = 9)	40% (*N* =10)	16% (*N* = 4)	8% (*N* = 2)	0.0% (*N* = 0)	1.96	0.94
Hearing aids	24% (*N* = 6)	68% (*N* = 17)	8% (*N* =2)	0.0% (*N* = 0)	0.0% (*N* = 0)	1.84	0.55
Cochlear implants	20% (*N* = 5)	68% (*N* = 17)	8% (*N* =2)	4% (*N* = 1)	0.0% (*N* = 0)	1.96	0.68
Remote microphone assistive devices	20% (*N* = 5)	64% (*N* = 16)	12% (*N* = 3)	4% (*N* = 1)	0.0% (*N* = 0)	2	0.71
Understanding how the degree of hearing loss impacts speech?	76% (*N* = 19)	16% (*N* = 4)	4% (*N* = 1)	4% (*N* = 1)	0.0% (*N* = 0)	1.36	0.76

Again, participants were asked to leave any comments in relation to the above questions if they felt it was necessary. Many participants discussed that *'hearing is an important part of speech and language development'* and that training on these areas would only provide some benefit. Although, it was noted that some sections should have more emphasis than others. One participant responded:

"I also strongly agree that training as a speech therapist in the areas of how deafness impacts communication and wellbeing overall is important, as well as the history of Deaf Education and bilingual bicultural communication approaches for Deaf children and the importance of self-advocacy and independence".

(Questionnaire participant)

The above discussion outlines the results obtained from the questionnaire. Due to the limited number of responses obtained via the questionnaire further data collection was completed via the implementation of semi-structured interviews. Below display the results from these conversations.

3.6 Interview data analysis

The following results outline the data obtained through semi-structured interviewing. Via the implementation of thematic analysis, themes and sub-themes have been identified throughout participant responses. The following discussion outlines key findings relevant to knowledge of hearing loss, perspective of collaboration and future professional development opportunities. A summary of the themes and sub-themes is outlined in the following table (see table 10).

Table 10: *Summary of key and sub-themes*

Themes and Sub-themes
Theme one: Knowledge of hearing assessment and hearing technology • New born hearing screen and before school check • The audiogram • Hearing technology

Theme two: Perspective on collaboration
• Workplace setting
• Barriers to collaboration
  o Role of speech therapists versus the role of audiologists'
  o Bridging professions

Theme three: Further information • Referral pathways • Assessment data and report writing- layman's language • Awareness of professions • Moving forward
Theme four: Unique differences

Theme one: Knowledge of hearing assessment and hearing technology

The first theme encompasses the responses participants provided in regards to their understanding of hearing assessment and management, explicitly discussing hearing technology.

<u>New born hearing screen and before school check</u>

Two participants discussed the new born and the before school hearing screen. The participants outline the role in which the standardised assessments influence the clients they support with hearing loss and the influence these assessments have on the number of individuals on their case load, with late or unidentified hearing loss. One participant acknowledges the new born hearing screen and how this standard assessment impacts the management of the clients on their case load.

"Often there has already been hearing checks, particularly with the paediatric population because they have their standard ones throughout development at the different stages, like the new born hearing screening tests and things like that. So, it is kind of something that you read about in the notes and it has happened but you never actually have any direct involvement with that process."

(Participant two, Public Hospital; Paediatric)

Further the *"before school checks"* are noted by a second participant. The before school screen was referred to in the context of passing on referrals to the Ministry of Education, where hearing may be queried. Demonstration of these hearing screens is essential in understanding the referral process before a full comprehensive hearing assessment is completed.

<u>The audiogram</u>

The audiogram is a demonstration of an individual's hearing threshold across a range of different frequencies, important for speech and language development. The participants discussed their exposure to audiograms and how the interpretation of these results impact the management for individuals with co-occurring speech, language and hearing impairment.

"Um comfortable-ish. I am not great with the labelling moderate, severe, profound, you know, I don't know where those sit. But I know, I have a good enough picture in my head of the speech sounds placement that I would be able to know they would hear some, none or all."

(Participant four, Deaf Education)

"Because they gave us the audiogram… and I didn't understand that. I kind of had to look back on my audiology notes to be able to understand but yeah, it would be nice if it was written in speech therapist friendly or parent friendly language… I just don't do it enough to be able to do it I think. I would need someone to help me understand an audiogram I think."

(Participant three, Special Education)

"No, I would definitely ask for help. I wouldn't feel confident doing that. I think I would trust myself to be able to ah infer some things or, yeah get a few impressions. But I would never try to do that independently I would definitely ask for help from someone or from google if it came to that."

(Participant two, Public Hospital; Paediatric)

The above quotes from participants highlight the different confidence levels and experience each SLT has had interpreting hearing results provided by an audiologist. Each participant highlights the different methods they would use to help support their understanding. One participant further discusses in their work setting that there is *"normally a really small summary at the end and normally an Ear Nose and Throat specialist (ENT) is there so they sometimes interpret that a lot better."*

Hearing technology

The four participants all made note of their individual experience in relation to hearing technology. They broadly spoke of how this influences their work, when considering co-morbid speech, language and hearing impairment.

"I only know some devices because my mum has hearing aids and so she tells me all about what her audiologist has said about them. But I guess they range so much…In terms of would it be beneficial? I think definitely and I work a lot in the stroke unit and especially when communication is impacted and they can't tell you how they use their devices or what is new and coming out and how to change batteries or how to do that kind of component."

(Participant one, Public Hospital; Adult)

A second participant noted their experience with learning how to use hearing aids.

"I had to learn quite quickly in adults how to use hearing aids and that was genuinely sort of a trial and error thing. No one ever formally showed me."

(Participant two, Public Hospital; Paediatric)

The following example emphasises the importance of understanding how to troubleshoot a hearing device. In the quotation below, the participant alludes to the importance of having access to instructions to support the trouble shooting process.

"Yeah, I think it's really helpful the girl can tell me when something is wrong and she shows me how to do the batteries. But she hasn't got the fine motor control to do it herself, but she will show me how. But if she couldn't tell me that I think I would be like what am I doing? So, it would be good to have like a set of instructions or something."

(Participant three, Special Education)

Theme two: Perspective on collaboration

All participants spoke of their personal experience of collaboration in a general sense. The following sub-themes outline common factors reported to be influencing the current level of collaboration between the two professions.

Workplace setting

The four participants each have different work place settings, all specialising with clients from different populations. Thus, the contrast between the participant's perspective on collaboration is vast. Two participants from the public setting, working with different populations discuss their experience of collaboration with the audiology profession. As discussed above in the questionnaire analysis, many SLTs identified minimal collaboration with audiologists.

"Um, well I work in the acute setting, so I would agree with this. Mainly because we don't often work very closely with audiologists. I think the only time that I have has been through ENT and audiology when it has been a cleft palate child."

(Participant one, Public Hospital; Adult)

"Yeah I would agree with that statement. I think that, ah particularly in the hospital environment you sort of are, quite separate in your services and while there might be links through referrals, you might never have face to face contact."

(Participant two, Public Hospital; Paediatric)

A third interviewee, who works in special education shared their perspective on this. The perspective from this workplace setting was also in agreement with the responses

obtained via the online questionnaire. The following explores the experience of collaboration for this individual.

"Yeah I think, yeah I agree with that. I have never had contact with an audiologist in my workplace, about any of my students but I guess that is probably because they usually come to us already with a solution or a plan. But we do actually have to request usually from the parents the audiology reports, which are helpful. But, yeah, I haven't really had any like face to face contact with any audiologists for my students."

(Participant three, Special Education)

In contrast, one participant discussed the unique workplace setting and how this has allowed for collaboration with audiology services.

"Well mine is incredibly unique, um it's one of only two settings of its kind in the country and we have four speech language therapists and X have about three or four speech therapists I think, so our bubble is very unique to our context".

"But we have, well they don't actually have an audiologist at the moment but that's by the by, but in my context, we have a lot of collaboration with our audiologist. And in fact, this second half of this year, more than before."

(Participant four, Deaf Education)

Barriers to collaboration

In addition to the workplace setting and how this influences the amount of collaboration a SLT has with audiology services; further barriers were discussed by participants.

Role of the speech therapist versus the role of audiologists': The participants highlighted the importance of understanding what the role of the audiology profession has, in the individual setting. Participant one identified that *"we do have audiologists in the hospital, but I am not sure exactly what their role is".* Further a second participant noted

"I guess you often don't know how you might be able to utilise the other, they might not know how to utilise us in some ways and vice versa, because we don't fully understand each other's roles or what we could do together."

(Participant two, Public Hospital; Paediatric)

"Another thing that, research suggested and it makes sense is that both sides have an understanding of each others role and the value they can bring. I think that is really important to really kind of get why, understand why and you know, how they can help I guess. Often when people understand how somebody else can help them, they want to talk to them."

(Participant four, Deaf Education)

Bridging professions: Another theme discussed by the four participants was the significance of the MDT when working with complex cases.

"And have required thinking outside the box a little bit and I guess just also, they have, there have been several times we have sat down, you know, himself, myself and other specialists and said what is going on here?"

(Participant four, Deaf Education)

The remaining three participants made note of various professions and organisations that help to support their management across settings. The *"Ministry of Education", "ENT"* and *"primary school teachers"* were the main professions and organisation discussed in supporting understanding of hearing loss and the management plans developed for individuals.

Further, one participant discussed *"individual education plan (IEP) meetings"* and how this allocated time is used to discuss an individual and their needs. The meeting can be utilised to discuss progress and the next steps in supporting an individual with complex needs. The participant discussed this opportunity in the context of counselling the parents about the role hearing has on speech and language development.

"Well I, the way that I have approached it so far is that in the IEP meeting I have just discussed with them that hearing is so important, they need to be wearing it all the time to get language input."

(Participant three, Special Education)

Theme three: Further information

Referral pathways

The referral pathway to audiology services changes depending on the workplace setting, client age group and the services that the individual may require. One participant

noted that their understanding of the referral pathway is *"minimal to absent, I would genuinely ask the medical team or one of the senior SLTs."* A second participant noted that their understanding *"would probably be limited, only because I don't think I have ever done one."* Further, another participant described their understanding of the referral pathway to audiology as *"pretty low. I think for everything, I just asked the GP to do it because I don't have enough knowledge about specific places to go."*

The following quotation highlights that some SLTs will understand the referral pathway relevant to their daily work, but may not understand the other processes outside of their work setting. For example, one participant noted *"I don't understand the referral pathway outside of our organisation."* Although the referral pathway outside of an organisation isn't entirely relevant, it is still important to understand other processes that your client or student may be exposed to. Due to the responses from the participants, referral pathways have been identified as an area where further information would be beneficial. This is consistent with responses obtained via the questionnaire.

<u>Assessment data and report writing- layman's language</u>

Noted above, the importance of gaining sufficient information that is easily understood for parents and SLTs' is significant. During conversation with participants it was a common theme stating that the information, such as assessment data and reports provided to parents and other professionals could be challenging to interpret. The following quote highlights an experience of a participant suggesting the use of layman's language would be beneficial.

"They gave us the audiogram… I didn't understand that. I kind of had to look back on my audiology notes to be able to understand, but yeah. It would be nice if it was written in speech therapist friendly or parent friendly language".

(Participant three, Special Education)

Awareness of professions

As reviewed above, participants discussed the role of an SLT versus the role of the audiologist. The emphasis on increasing awareness of the other profession is a noteworthy consideration for further information. One participant suggested *"Just asking if there's anything that we could also help them with as speech therapists and how much they understand about our role. Kind of meet in the middle".* Another participant noted that after completing the questionnaire, *"awareness"* of the other profession would be a factor that would contribute to improving collaboration between the two services.

Moving forward

Upon considering further information, it is critical to acknowledge the steps that could be taken when moving forward. The below quotations highlight ideas recommended from the speech therapy perspective.

"I wonder if even when a student comes into our service, even maybe just a phone call with audiology or something to discuss their hearing needs, because I know it's all given to the parents, but a lot of the time even the parents have other needs themselves, or forget the importance of hearing... when the kids start or a report that comes with the student and all their information."

(Participant three, Special Education)

Although the participants identified many similar steps that could be beneficial moving forward, one participant discussed the importance professional development about hearing assessments for those with complex needs would add to the unique work setting.

"It would be really helpful to, just maybe even get a bit more, I don't know PD around audiology and because obviously with our kids, a lot of them can't actually do the hearing test because, I think with the way the hearing tests are they need to be able to give a response… upskilling in the area of identifying if someone has a hearing problem that has special needs, so we could refer because it is really hard to know especially with our kids with autism whether it is hearing related or they're just not engaged."

(Participant three, Special Education)

Theme four: Unique differences

Through the completion of semi-structured interviews there have been many themes that have occurred across all responses. Discussed above is the contribution workplace setting, understanding of SLT role versus the role of an audiologist and access to further information have on the ability to collaborate. Amongst these examples, one participant has a contrasting experience *"that is incredibly unique"*, that provides an example of how the listed factors can influence more successful collaboration when audiology and speech therapy are a part of the same MDT.

"But in my context, we have a lot of collaboration with our audiologist. And in fact this second half of this year, more than before, so um, we have started a few new things this year… So, we now have group supervision, so the SLTs and the audiologist together and journal club with the SLTs and the audiologist together… but before that we were having

case study discussions… so we are often interacting on a student specific level and that's probably where most of the collaboration is."

(Participant four, Deaf Education)

The above quotation demonstrates a range of activities where collaboration between two professionals can be successful when their case load is inclusive of students who benefit from input from both professionals. This section has reported the findings from both the questionnaire and semi-structured interviews. The following discussion chapter will consider these findings in reference to previous literature.

4 Discussion

The current study investigated New Zealand SLTs' knowledge of hearing loss and perspectives on collaboration with the audiology profession. The study also aimed to identify SLTs' perceived needs for professional development, in relation to hearing loss and management. Further, the barriers to successful collaboration were identified, addressing potential methods to overcome these in the future.

'*What knowledge do speech language therapists have about hearing/ hearing loss?'* was the first research question. This included examining SLTs knowledge of normal hearing anatomy, aetiology and hearing assessment. Further, the participants experience of working with individuals with hearing loss and exposure to hearing related information was explored.

Results suggest that SLTs in New Zealand have individuals on their case load with hearing loss, regardless of their workplace setting. The participants of the current study have experience working across a range of contexts, some of whom have experience across more than one clinical setting. The settings included, 'acute hospital', 'private', 'MoE' and 'special education' but were not limited to these contexts. The vast range of clinical settings influenced the number and age groups of individuals with hearing loss that contributed to each participant's current caseload.

The demographic information provided by the SLTs in this study highlighted that all participants had experience working with a client with an identified hearing loss. This data reflects that reported by Kobylas (2016) where it was noted that SLPs' working in schooling environments had interacted with a student with some degree of hearing loss. Further, all participants noted that they had experience working with traditional hearing aids, with over half of participants reporting experience working with cochlear implants, BAHS and remote microphone assistive devices.

Participants of the current study were asked if they would feel comfortable completing a device check before a session began. It was noted that depending on the device some would feel comfortable, others noted that they did not know how to do this. Further, during semi-structured interviewing, the participants alluded to the limited training they had on devices. Responses discussed the *'client's showing them how to use the device', 'trial and error'* or '*gaining information from family members with hearing devices'*. One participant noted the limited training she had on this aspect of hearing management. Again, the response to this question was consistent with Kobylas (2016), where it was discussed that often SLPs were not equipped with resources to perform basic troubleshooting of hearing technology. The current results emphasise the importance of SLTs undergoing training in basic device functioning. As noted by Woodford (1987) it is a requirement for SLPs trained in America to complete studies in hearing aid technology. It is essential to know whether hearing equipment is functioning. This ensures accuracy of the results obtained during speech or language assessment or during intervention. Stating that the client is wearing functioning devices is also beneficial.

Speech therapist education on hearing loss

The first research question further explored the exposure participants have had to hearing related content. All participants identified that they have engaged in a course that had content relevant to hearing and/ or hearing disorders. When referring to Lass et al. (1985) only 75.3% of special educators and 37.8% of teachers have participated in a course that had hearing in any capacity noted. Further, when Lass et al. (1989) explored SLPs' knowledge, exposure and attitudes towards hearing aids, it was noted that less than half of the participants had between 1-5 hours of academic exposure and a smaller 11.4% had no academic learning on this topic. The results of the current study contrast these statistics, noting all participants,

regardless of their location (country) of study have been exposed to some content on hearing. Is the information during these courses, whether focused or embedded relevant and enough? SLTs further identified areas in which further professional development would be beneficial. Over half of the participants identified that they have participated in a course that was exclusive to hearing, rather than embedded content in another professional course. Additional information about the courses included an *'introduction to audiology paper', 'aural rehabilitation'* and *'hearing and acoustics'.*

Consequences of hearing loss

The following discussion is relevant to the first research question, considering the SLTs' perceived impacts of hearing loss. When asked what the main consequence of hearing impairment is, participants responded with the *'loss of ability to hear others talk'.* The participants were provided seven statements to select from. This was not consistent with the finding from Lass et al. (1985) and Coombe (2018) where *'a feeling of isolation'* was the main consequence selected. The current participant sample selected this as the second significant consequence.

The results from this questionnaire demonstrate that SLTs acknowledge the barriers hearing loss can cause for successful communication. There are important frequencies that are essential for speech understanding (Lang-Roth, 2014). Further, the participants identified an implication that can result when one experiences barriers to communicating. Feeling isolated can result from not hearing others *'talk'.* As discussed by Coombe (2018) there was a gap in literature when understanding teachers' perception of hearing loss impacts. This gap extends to understanding SLTs perceptions, relevant to the New Zealand population.

Although the examples provided in the question are negative connotations of hearing loss, when provided with an *'other'* option, participants also noted positive consequences that

are linked to hearing impairment. The responses of the participants identify the benefits of being able to experience Deaf Culture allowing the individual to experience a strong sense of identity and inclusion (Hyde & Power, 2004; Meador & Zazove, 2005). These results contribute to a second dimension when considering the impacts of hearing loss. The current literature considers the negative impacts of hearing loss and the outcomes associated. It is a noteworthy aspect of the data obtained as it ensures the complex nature of hearing loss is acknowledged.

Knowledge of hearing anatomy and types of hearing loss

Seven questions explored the participant's knowledge of hearing anatomy and types of hearing loss, with the aim of answering the first research question. The results obtained suggest that participants have a broad understanding in both areas. Almost all participants identified the cochlea as the *'organ of hearing'*. All participants correctly demonstrated that presbycusis is jargon for aging hearing.

When asked about OM, the participants demonstrated a good understanding of the impacts that this has for an individual and their hearing. This finding is consistent with the understanding of aetiology of acquired hearing loss explored in the teaching population in New Zealand (Coombe, 2018). Further, this finding could be linked to the prevalence of OM in New Zealand (Bluestone, 2004; Paterson et al., 2006).

The normal hearing mechanism can be impacted in many ways. It was decided to explore the level of understanding of this component of audiology within the speech therapy population, to establish a perspective for the New Zealand context. On consideration of the responses, participants could identify that SNHL is associated with permanent hearing loss. Conductive and mixed losses were also selected as responses, but the frequency of these responses was smaller than SNHL. This response demonstrates that there is a baseline

awareness amongst the speech therapy profession. The types of loss that contribute to a fluctuating loss were also identified, but less accurately in comparison to the SNHL question. The current literature discusses the pathologies that are permanent and fluctuating (Pajor & Jozefowicz-Korczynska, 2008). Further information to support this finding would be developing an awareness of what pathologies SLTs in NZ have been and are commonly exposed to, determining if there is a correlation between this result. As noted above, participants demonstrated a good understanding of OM and the impacts this has.

Knowledge of audiological assessment

Understanding of audiological assessment was another component of hearing that was explored to determine the participants' knowledge of hearing. Participants demonstrated their understanding of different audiological assessment and the age group that it is routinely implemented. Many participants could identify the typical ages for ABR and PTA. Although the question was aimed to explore the most common age group, it is essential to remember that depending on the age and needs of the client, different assessments can be utilised. The participants often mixed up the age group for VRA and play audiometry. Although the play audiometry age group demonstrated some confusion, when asked, most participants could identify the main purpose of play audiometry.

Participants included in the semi-structured interviewing demonstrated their knowledge of further audiological assessment. The UNHSEIP and before school hearing check were both discussed. The implications the two assessments have on early identification of hearing loss were acknowledged. Further, the benefits this has for successful speech and language development were recognised. Korver et al. (2017) discusses the importance of early detection and timely intervention that follows. The UNHSEIP was introduced to New Zealand in 2010, where it is routinely implemented (Ministry of Health (MoH), 2018). The

implementation can be attributed to the number of individuals who experience speech and language impairment due to hearing loss. This is a contributing factor to the number of individuals on a SLTs caseload with hearing loss. This was a notable discussion point of the semi-structured interviews. With early management, communication can develop successfully (Kobylas, 2016).

Knowledge of hearing technology benefits

Two questionnaire questions demonstrated the participants' understanding of hearing technology benefits. The responses were analysed to answer the first research question. When asked if anyone with a hearing loss could benefit from a hearing aid, almost all participants could identify that this statement is false. This finding is similar to results from Lass et al. (1989) in which almost all of the participants could identify this as an inaccurate statement. The rationale provided by participants demonstrated a range of influencing factors such as type and degree of hearing loss.

Further, over half of the participants could demonstrate that although an individual is fitted with a hearing device, their hearing will not always be capable of hearing in the normal range. Again, participants discussed the influence degree of loss has on this outcome as the benefit will *'depend on the extent and type of hearing loss.'* This response is consistent with the current discussion around the perceived benefit and hearing aid outcomes (Lopez-Poveda et al., 2017; Macherey & Carlyon, 2014).

The second research question, *'what are speech language therapists' experiences and perspectives on collaborating with audiologists?'* aimed to gain an understanding of the current collaboration between audiologists and SLTs in the New Zealand clinical context. Results showed that there is currently limited collaboration occurring between speech therapy

and audiology services. The following discussion explores both the questionnaire and semi-structured interviewing results in relation to the current literature.

Perspectives on collaboration

To understand the current perspectives on collaboration with the audiology profession, participants were asked to provide examples and discuss their personal experience. Many of the participants identified that they have had limited experience directly collaborating with an audiologist. This result was consistent across both the questionnaire and semi-structured interviews.

When asked to describe the role of an audiologist the participants responded with a wide variety of different tasks audiologists engage in, depending on the workplace setting. The first theme identified by participants encompassed the *'clinical responsibilities'* audiologists implement. Responses included the *'role in assessment, 'providing recommendations', 'follow-up'* and *'further referrals'*. In addition to the routine clinical duties, participants acknowledged the *'education and counselling'* audiologists must engage in. The responses relevant to this theme include *'supporting and educating a family about hearing loss'* and *'device management.'* These responses are consistent with the current literature about the profession and role of an audiologist. It is significantly emphasised that the role of an audiologist is extensive, engaging in several tasks identified by participants (Danermark & Manchaiah, 2017; Doak et al., 1985). Throughout interviews, participants discussed the need for understanding the role of the 'other' profession. It was discussed that without this understanding, knowing the most effective way to utilise resources was limited, therefore acting as another notable barrier to collaboration.

When asked to identify their last contact with an audiologist over half of the participants noted that the most recent contact was within or over the last three-month period,

but only a small number of participants had engaged with an audiologist in the last week. When asked, what contact the participants were having with audiology services, the most common responses highlighted access to services via referrals, requesting reports and phone calls. Further, workplace setting is attributable to the amount of collaboration between speech therapy and audiology services.

Workplace setting was a recurring theme noted by participants included in the semi-structured interviews. The discussion around work context influenced the amount of exposure the SLT had to audiology services. The importance of the MDT in complex cases was emphasised. There is a range of bridging professions that are evident in contributing to the amount of direct collaboration SLTs are having with audiology services. This information is consistent with that reported in the questionnaire, where different rationales were provided explaining why individuals had no example of direct collaboration. As there is no current literature on the New Zealand perspective on collaboration between SLTs and audiologists, it is challenging to determine how long this viewpoint on collaboration has existed at varying levels in the New Zealand context. The current discussion provides significant information, when considering future interaction between the two professions.

McShea et al. (2016) discussed individuals with complex needs and the challenges that present when identifying hearing loss. A participant from the semi-structured interviewing discussed the need for understanding how to distinguish between a hearing loss and lack of engagement. The participant noted that *'professional development to support identification of a hearing loss would be beneficial as it can be challenging to know if an individual with complex needs has a hearing related need or if they are not engaged'.* This point is significant upon consideration of collaboration. The current literature suggests that many health professionals experience challenges recognising hearing loss (Kerr et al., 2003;

McShea et al., 2016). These results and discussed experiences highlight the essential need to consider whether input from audiologists would be beneficial in this scenario.

The importance of collaborating ensures that individuals with speech, language and hearing impairment are working towards one goal. If each specialist providing input is working towards a different component, progress is slowed as appropriate services are not provided (Kobylas, 2016). The need to improve collaboration in the New Zealand clinical setting was emphasised. Recommendations to support this was *'provision of more routine, speech therapy friendly reports', 'information on devices'* and *'case-based phone calls or meetings'.*

Although the need for more collaboration was a recurring theme amongst the data collected, it must not be forgotten that in unique clinical settings there is a significant amount of collaboration implemented. As noted above, one interviewee discussed the unique nature of their workplace setting, in which the audiologist and SLT engage in collaborative practice. The participant described the interactions to be *'on a student specific level'* where a *'journal club'* and *'group supervision'* is implemented.

The third research question asked, *'what professional development opportunities and further information about hearing loss do speech-language therapists' want to support their work?'.* The responses from the questionnaire and semi-structured interviews suggest that there are various components of audiology where SLTs believe further professional development would be beneficial. The results are discussed with reference to the current literature in the following section.

Further information, case discussion and the multi-disciplinary team

When asked what information, the participants would find beneficial in supporting clients with hearing loss, *'information about communication strategies for children with*

hearing aids' and *'information about how to trouble shoot hearing aids'* were the two most prominent responses. This is consistent with research conducted by Coombe (2018) where learning support strategies for children with hearing loss was identified as educational information that would support teaching practice.

Participants also highlighted the need for having a basic understanding of how hearing aids work. As noted above, the participants included in the questionnaire could identify basic information about the benefits of hearing technology, but the practical component of trouble-shooting hearing devices was highlighted as a future learning need. Semi-structured interviews allowed this aspect of audiology services to be understood in more depth. Participant responses were consistent with the questionnaire, identifying the need for more education around device troubleshooting. Overall, the above information is consistent with previous research that suggests continuing education programmes or resources would be beneficial in supporting understanding and providing relevant information about up to date hearing aids (Lass et al., 1989).

Further, the majority of participants identified that they agreed, training in 'diagnostics', 'aural/ auditory rehabilitation', 'hearing aids', 'cochlear implants' and 'remote microphone assistive devices' would be valued. Understanding how the degree of hearing loss impacts speech was identified as a significant area of audiology where further training is necessary. The results are similar to those identified by Kobylas (2016) where it was identified that the SLPs had received training in the above components of audiology, but felt that further training would arguably add to their foundational audiologic understanding and skills.

When asked what resources, participants used to gain hearing related information, many responded that they obtained information by Google or another such search engine. The Kelston and van Asch Deaf education centre websites were noted as resources utilised by

participants. When considering the sources Primary school teachers in New Zealand use to gain information, it was noted that many attended courses run by the two DECs in New Zealand, further the individual with the hearing loss was also used as a source (Coombe, 2018). Although these responses were not provided in the current questionnaire, a participant from the semi-structured interview provided insight into using the individual with the hearing loss as a method of understanding the individual's hearing technology.

On completion of semi-structured interviews, the all participants discussed their understanding of the referral pathway to audiology services. The information from the interviews confirmed that some SLTs are not familiar with the referral process to audiology services, supporting the results obtained during the questionnaire. Across the various workplace settings of SLTs, it was evident that the referral pathway to audiology services varies greatly. Along with information around the referral process, interview participants noted that report writing in layman's terms would be beneficial moving forward. Further, participants discussed the lack of understanding the role of the SLT or audiologist in their given workplace. This was considered a barrier to collaboration. When considering further information, this was desired to improve the connections within the MDT.

It was identified that reports provided to parents and later, other specialists such as SLTs, would be better written in layman's terms. Many participants noted that the technical language and the audiological assessment data such as the audiogram, was sometimes challenging to interpret, thus creating further challenges in understanding the impacts the hearing loss has on an individual's speech and language.

4.1 Clinical Implications

SLTs highlighted the need for understanding the role of the audiologist in their work context. This is a critical consideration when there is a difference in the service provided by

both professions. Understanding one another's role will ensure that the services can be utilised effectively for an individual who seeks support for speech, language and hearing. On establishment of the goals with the specific client, both professions can adapt their management plans, streamlining to ensure progress. One approach that would ensure understanding of one another's work, is a meeting between the two professionals. Upon discussion, it could be determined the most effective method of reporting hearing and hearing technology information. Establishing guidelines will ensure a better understanding of client specific information.

SLTs who participated in the questionnaire and semi-structured interviews alluded to the current information that is being passed between speech and language therapists' and audiologists'. It appears across some clinical settings that SLTs are relying on information about hearing status to be passed on from parents or other bridging professions such as AoDCs or ENTs. This is contributing to the insufficient information being passed and the minimal collaboration with SLTs. It would be beneficial to streamline this process.

Engaging in professional development that targets but is not limited to the following areas would be beneficial, as identified via the questionnaire. Programs with strategies to support audiogram interpretation, types of loss, impacts hearing loss will have on speech and language development, and device functioning and troubleshooting would support the understanding of information. Further, implementing the use of layman's language into reports and other information provided to parents and members of the MDT to support understanding is a critical consideration.

Although the above is what is currently reported, it is vital to note that the study also highlighted that in unique situations, there is an exception, where SLTs have more exposure and knowledge to the above information. In work settings, such as one of the DECs, contact with the audiologist is more readily sought due to the access that is provided by both services.

This setting ensures information is readily accessible and further clarification can be sought due to the professionals working in the same vicinity, as members of the same team. Currently the DECs are developing online modules for teachers working with individuals with hearing impairment. It would be interesting to see in future if these resources could become accessible to other professionals working with hearing loss.

4.2 Study Limitations

The questionnaire component of the study included a small sample size of 25. This represents a small percentage (e.g., approx. 3% of NZSTA members) of practising SLTs in New Zealand. This is a significant limitation and limits the generalisation of findings. There are several factors that could have impacted participant responses rate. Reasons for the low response rate could include the time needed to complete the questionnaire (15 to 20 minutes). This is a significant commitment in busy professional life. Several partial or incomplete questionnaires were noted, potentially indicating participants' frustration with the length of the questionnaire. Motivation, limited time or the relevance of the questionnaire to the participant may have contributed to these results. However, the addition of semi-structured interviewees allowed the researcher to explore components of the questionnaire in more depth. Further, speech therapy in New Zealand is not registered profession and it is not a requirement to be a member of the NZSTA. Therefore, there is no central registry of SLTs' in New Zealand. This is a limitation for the current research project. Without a central registry, it was challenging to determine the number of SLTs who were exposed to the questionnaire link posing further challenges with the distribution of the questionnaire.

The online component of the study had the potential to create bias. The individuals who participated may have had different motivations for their willingness to participate. The clinical relevance and advocacy it might have for their individual case load, their interest in

speech and language, the impact of hearing, and individual professional development may have been contributing factors.

The interview component of the study had a similar limitation, the small sample size. Further, three of the four participants are practising in a location where the services for individuals with hearing loss are plentiful. Due to participants practising in one of the Deaf Hubs within New Zealand, it could be asked whether their experiences, although across various workplace settings is a full and accurate representation of the experiences of SLTs in New Zealand practising in other locations.

4.2.1 Questionnaire limitations

One of the questions specially asked the participants to match an audiological assessment with the appropriate age group. This question although the responses provided, aligned correctly with clinical protocol, failed to mention that some of the audiological assessments such as the ABR can be used for participants of all ages. This may have been misleading to participants who were aware of this. As there was no text response provided asking for rationale, participants could not explain this in their submitted response. In future, it would be beneficial to re-word this question.

The question *'which of the following are associated with a permanent hearing loss?'* answer is ambiguous. Many participants noted the responses that both SNHL and mixed hearing loss are permanent in nature. It is critical to note that children and adults can experience a permanent conductive hearing loss. For example, those born with aural atresia or via the surgical procedure mastoidectomy (Brito, Pozzobom Ventura, Jorge, Oliveira, & Manzoni Lourencone, 2016; Khan, Udaipurwala, Mehmood, & Rahat, 2017). Depending on the participant's knowledge of hearing loss pathologies or interpretation of this question the

responses varied. If asked in future, it would be beneficial to ensure the question is limited to one interpretation, with a clear response in mind.

Some 'text' answers were challenging to analyse as some responses were missing words or had incomplete sentences. Further, some of the later text responses were skipped over by participants. Although these responses still provided some insight, in future the researcher may reduce the amount of 'text' responses in the questionnaire.

4.3 Future Research

The study and questionnaire limitations are areas that could be improved in future follow-up or like research. It is critical these limitations are addressed. In relation to the New Zealand context, there are other health professions that could inform this topic. For example, AoDC's or allied health professionals. Applying the above limitations to future research will strengthen future data, contributing to the literature.

Both the questionnaire and interviews have contributed to the direction for future research. The above discussion highlights areas of hearing that SLTs have identified that they would like further training or to seek extra information. Often collaboration can be challenging due to the distribution and access to resources. Conducting a more in-depth analysis to support the production of a professional development package or training resource suitable for SLTs would be beneficial. This could be completed via the implementation of semi-structured interviews, targeting the wider New Zealand geographic, workplace and experience demographic. The interview component of the current study focussed participants who are practising and are exposed to various services that support individuals with hearing loss in one city boundary. For example, the Southern Cochlear Implant Programme, van Asch Deaf Education Centre and access to AoDC services. The main centres in New Zealand have ready access to these resources, however for those living in rural areas, access to resources is

likely to be limited. Physical location and awareness of hearing services have previously been identified as barriers to hearing rehabilitation services. Hence, exploring the experiences and perspectives of those based away from main centres would be critical. Each location in New Zealand will have their own unique context. This will provide anecdotal information to understand the experiences of SLTs practising without immediate access to these services, identifying their specific needs for further information and professional development programmes (Jerram & Purdy, 1996).

To extend this research further, focus groups could be implemented as a pre-and post-measure to determine the effectiveness of developed resources. The need for this research would support the development of resources to ensure that SLTs have access to relevant information that is known to be appropriate and accurate.

As noted above, the distribution and access to resources is often restricted. Research focussing on the accessibility to audiology services and audiology related resources would complement the above recommendation. It is critical that the audiologist and SLT work together to ensure successful speech, language and hearing outcomes. This can only occur when access to the services is available. The results of a study of this topic would provide an understanding of how often audiology services are being accessed, for what purpose and components restricting this access. Understanding of the referral pathway is another element of access to services that further research would be beneficial.

Finally, research exploring the perspective of audiologists need for collaboration with SLTs would be advantageous. For changes to be observed, it is critical to understand the viewpoints of both professions. This research could focus specifically on audiologists' understanding of typical speech and language development, acoustic phonetics and the importance of fitting hearing aids to support speech perception and intelligibility. Further

research in this direction would support the findings of the current study, identifying similarities that could be focussed on dually for each profession.

5 Conclusion

The current study contributes to our understanding of SLTs' knowledge of hearing loss and perspectives of collaboration with audiology services, specific to the New Zealand population. Teachers', special educators', health educators' and speech pathologists' knowledge and exposure to hearing loss was explored in previous literature, considering future learning needs for the participants in their chosen profession and work place setting (Lass et al., 1985; Lass et al., 1990; Lass et al., 1989).

The findings from the current study emphasise the importance of providing further information to SLTs about selected components of hearing loss and management. By providing this information, the effectiveness of management for individuals with speech, language and hearing disorders will improve. With the understanding of the current clinical setting an effective next step in professional development and collaboration can be determined.

Overall, the participants demonstrated awareness and knowledge of hearing loss in a general sense. With all participants engaging in some training course of hearing or hearing related content, provides confidence in their exposure to hearing loss. Although they have engaged in this training, participants of the study identified several areas where further information would be beneficial in supporting the management of clients with a dual speech, language and hearing impairment. Relevant topics to include in professional development or resources for SLTs would be hearing technology, specifically considering device trouble-shooting, referral pathways to audiological services and information about communication strategies for individuals with hearing aids. At present, SLTs are using online resources, such as a Google search engine, or other like systems to access desired information. Further, SLTs are requesting relevant information from caregivers or other family members who have access to information provided by the audiologist.

Currently, the DECs are developing online module resources to suit the needs of the primary school teaching profession. It would be hoped that in future, like resources would become available to other professions exposed to hearing loss.

On consideration of the minimal collaboration discussed by SLTs, it suggests more contact between the two professions would be beneficial. Professional development courses or case-based discussion could have a positive effect on the collaboration between the two professions. Outlining the roles of each profession across various clinical settings would ensure members of the professional bodies could utilise one another effectively and with efficiency. There has been previous discussion about a joint conference occurring between the NZAS and the NZSTA. If this concept came to fruition it would provide an opportunity for collaborative professional development (P. Peryman, personal communication, January, 08, 2020). The opportunity a joint conference would provide would be significant, establishing a collaborative path moving forward.

The current research project explored the understanding SLTs have on hearing, hearing loss and experiences and perspectives on collaboration with audiology services. The current findings emphasise the importance of having a foundational understanding of an impairment that may impact clients on a SLTs case load. Further, the findings highlight the significance effective collaboration between SLT and audiology services. Successful collaboration with ensure clients receive services would have for client outcomes, providing them the best opportunity to overcome their hearing and communication challenges.

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7 Appendices

7.1 Appendix A: Ethical Approval Letter

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

HUMAN ETHICS COMMITTEE

Secretary, Rebecca Robinson
Telephone: +64 03 369 4588, Extn 94588
Email: human-ethics@canterbury.ac.nz

Ref: HEC 2019/28/LR Amendment 2

14 November 2019

Ryah Collinson
Psychology, Speech and Hearing
UNIVERSITY OF CANTERBURY

Dear Ryah

Thank you for your request for an amendment to your research proposal "New Zealand Speech Language Therapists' Knowledge of Hearing Loss and Deaf Culture" as outlined in your emails dated 1st and 8th November 2019.

I am pleased to advise that this request has been considered and approved by the Human Ethics Committee.

Yours sincerely

pp. R. Robinson

Professor Geoffrey Rodgers
Deputy Chair, Human Ethics Committee

7.2 Appendix B: Qualtrics Questionnaire

Knowledge of Hearing Loss and Perspectives on Collaboration with Audiologists

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Start of Block: SURVEY INSTRUCTION

Start of Block: Informed Consent

School of Psychology, Speech and Hearing | Te Kura Mahi ā-Hirikapo
Email: ryah.collinson@pg.canterbury.ac.nz
Date: 16th September 2019
New Zealand Speech Language Therapists' Knowledge of Hearing Loss and Perspective on Collaboration with the Audiology Profession.

Kia ora, my name is Ryah Collinson and I am a Master of Audiology student at the University of Canterbury. I am completing research that aims to explore New Zealand Speech Language Therapists' knowledge of hearing loss and their views and experiences of collaboration between the two communication disorder professions.

The study involves the completion of an online survey, estimated to take 15-20 minutes to complete. The survey includes different sections that are designed to explore your knowledge and experience of working with people with hearing loss. The survey will also explore experiences and perspectives on aspects of collaboration with the audiology profession.

All responses will be obtained via the current online survey. Your responses will remain anonymous as no names or identifying information is required. All data will be stored in password protected files on University of Canterbury computers.

If you wish to enter the prize draw for one of ten $20 gift vouchers, at the end of the survey you will be directed to another survey where you can enter your contact information. This data will be stored separately, and will not be linked with your survey responses.

Participation is voluntary and you have the right to withdraw or remove yourself from the study at any stage without penalty. To withdraw your data, or if at any stage during completion of the survey you feel stress and decide not to proceed, please simply close the survey browser window. All data that you have entered up to that point will be deleted. If any questions in the survey cause you stress, please consider raising this with your professional supervisor.
Once you have completed the survey and click the 'submit responses' button it will not be possible to remove your data from the study.

Data obtained will be used to form the basis of a Masters Degree thesis. It will be available to the public as part of an online thesis repository, through the University of Canterbury library. Further, results may be written and submitted for peer-review in a scholarly journal or presented at a professional conference. You can be assured complete anonymity of data you provide. No participants will be identifiable. Only the researcher and supervisor will

have access to the data. Raw data will be stored safely and destroyed after 5 years.

The research project is being carried out as a requirement for the Master of Audiology Degree at the University of Canterbury by Ryah Collinson (ryah.collinson@pg.canterbury.ac.nz). The study is being completed under the supervision of Dr Dean Sutherland (dean.sutherland@canterbury.ac.nz). We are happy to discuss any concerns that may arise about your participation in this project.

This project has been reviewed and approved by the University of Canterbury Human Ethics Committee. Participants wishing to lodge a complaint should address any complaints to The Chair, Human Ethics Committee, University of Canterbury, Private Bag 4800, Christchurch (human-ethics@canterbury.ac.nz).

Consent to Participate- I have read and acknowledge the study information above. I understand what the study requires of me, and the risks involved. By clicking the "proceed to the survey" button below I am providing consent to participate.

- ○ I consent, begin the study (1)
- ○ I do not consent, I do not wish to participate (2)

End of Block: Informed Consent

Start of Block: DEMOGRAPHICS

DEMOGRAPHICS

Q1 What is your age group?

- ○ 20-29 years (1)
- ○ 30-39 years (2)
- ○ 40-49 years (3)
- ○ 50-59 years (4)
- ○ 60-69 years (5)
- ○ 70+ years (6)

Q2 Please indicate which professional speech therapy degree/ programme you completed?

- ○ Bachelors Level (1)
- ○ Masters Level (2)
- ○ PhD (3)
- ○ Other (please describe) (4) _____

Q3 Which country did you complete your professional Speech and Language Therapy degree?

- ○ New Zealand (1)
- ○ Australia (2)
- ○ UK (3)
- ○ Canada (4)
- ○ Ireland (5)
- ○ Other (please describe) (6) _____

Q4 Within your programme, did you have a specific course that included content about hearing and/ or hearing disorders?

- ○ Yes (1)
- ○ No (2)

Skip To: Q6 If Within your programme, did you have a specific course that included content about hearing and/ or... = No

Q5 If yes, was this a full course or was content embedded within another course?

- ☐ Full course (1)
- ☐ Embedded within another course (2)
- ☐ Please provide any other relevant detail that you recall (eg; name of course/s, focus of courses) (3) _____

Q6 What setting do you practice in? (select all that apply)

- ☐ Hospital/ DHB (1)
- ☐ Private Clinic (2)
- ☐ Ministry of Education (3)
- ☐ Special School (4)
- ☐ Other (please describe) (5) _____

Q7 How many years have you been working as a speech therapist?

- ○ Less than 2 years (1)
- ○ 3-5 years (2)
- ○ 6-10 years (3)
- ○ More than 10 years (4)

Q8 Approximately how many referrals do you make to audiology in a year?

- ○ None (1)
- ○ 1-5 (2)
- ○ 6-10 (3)
- ○ More than 10 (4)

Q9 Please indicate using the stars below how comfortable you are with the referral pathway to audiology services:

5 stars = very comfortable (1)

Q10 Do any of your current clients have a hearing loss?

- Yes (1)
- No (2)
- I don't know (3)

Skip To: Q13 If Do any of your current clients have a hearing loss? = No

Q11 Approximately how many clients on your caseload have a hearing loss?

- 1 (1)
- 2 (2)
- 3 (3)
- 4 (4)
- or more (5) (5)

Q12 Please indicate which age groups of clients you work with, that experience hearing impairment:

- [ ] 0-5 years (1)
- [ ] 6-15 years (2)
- [ ] 16-25 years (3)
- [ ] 26-50 years (4)
- [ ] 50+ years (5)

Q13 Do any of your clients wear hearing aids (or another hearing device)?

- ○ Yes (1)
- ○ No (2)

Skip To: Q15 If Do any of your clients wear hearing aids (or another hearing device)? = No

Q14 Approximately how many clients on your case load have a hearing device?

- ○ 1 (1)
- ○ 2 (2)
- ○ 3 (3)
- ○ 4 (4)
- ○ or more (5) (5)

Q15 If you had a client with a hearing loss, would you feel comfortable checking that the device(s) is functioning before your session begins?

- ○ Yes (1)
- ○ Sometimes (2)
- ○ No (3)

Q16 Please provide rationale for the answer above:

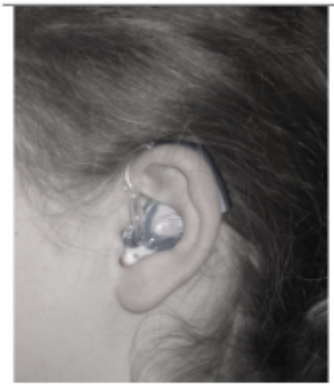
_____

End of Block: DEMOGRAPHICS

Start of Block: KNOWLEDGE OF HEARING LOSS

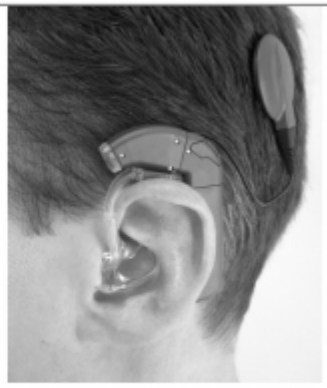
KNOWLEDGE OF HEARING LOSS, ASSESSMENT AND HEARING DEVICES

The following images help to clarify the difference between a hearing aid, bone conduction hearing aid and cochlear implant. These images will help to support your answer for the following question:



Hearing Aid

Bone Conduction Hearing Aid



Cochlear Implant

Q17 What hearing devices/ accessories have you had experience with? (select all that apply)

- ☐ Hearing aids (1)
- ☐ Cochlear implants (2)
- ☐ Bone conduction hearing aids (3)
- ☐ Remote microphone assistive devices (4)
- ☐ Other (please describe) (7) _____

Q18 In your opinion, the main consequence/s of hearing impairment are:

- ☐ A feeling of isolation (1)
- ☐ A feeling of insecurity (2)
- ☐ A loss of the primary warning systems (3)
- ☐ Loss of feeling that you are part of a living, alive world (4)
- ☐ Loss of ability to talk freely with others (5)
- ☐ Loss of ability to hear others talk (6)
- ☐ Other (please describe) (7) _____

Q19/20 Please indicate using the stars below your awareness of the risk factors for hearing loss (5 stars = very aware):

Adult risk factors (1)	☆	☆	☆	☆	☆
Paediatric risk factors (4)	☆	☆	☆	☆	☆

Page Break

The following questions are to gauge your knowledge and understanding of normal hearing anatomy, types of hearing loss and audiological assessment. Please answer honestly.

Q21 The inner ear or 'organ of hearing' is the:

- ○ Tympanic membrane (1)
- ○ Cochlea (2)
- ○ The auditory canal (3)
- ○ The malleus (4)
- ○ None of the above (5)

Q22 People who have a hearing loss for high-pitched sounds often can hear speech, but have difficulty understanding it.

- ○ True (1)
- ○ False (2)

Page Break

Q23 Please assign the following tests to the appropriate age groups:

	Age Groups			
	0-6 months (1)	6-30 months (2)	30 months- 5 years (3)	5+ years (4)
Auditory Brainstem Response (ABR) (3)	○	○	○	○
Play Audiometry (2)	○	○	○	○
Pure Tone Audiometry (PTA) (4)	○	○	○	○
Visual Reinforcement Audiometry (VRA) (1)	○	○	○	○

Q24 What is the main aim of play audiometry?

- ○ Measuring the compliance (flexibility) of the ear drum (1)
- ○ Measuring a hearing threshold at varying sound frequencies (2)
- ○ Indicates eustachian tube occlusion (3)
- ○ Cochlea function (4)

Q25 Distortion product otoacoustic emissions are a test of:

- ○ Middle ear function (1)
- ○ Cochlea function (2)
- ○ The auditory nerve (3)
- ○ Hearing threshold (4)
- ○ None of the above (5)

Q26 Presbycusis is commonly referred to as:

- ○ Aging hearing (1)
- ○ Ear infection (2)
- ○ Sensitivity to loud sounds (3)
- ○ None of the above (4)

Q27 Otitis media can cause the following (tick all that apply):

- ☐ Infection (1)
- ☐ Loss of hearing (2)
- ☐ Abnormal ear canal (3)
- ☐ Pain in the ear (4)
- ☐ Long term damage to the auditory system (5)

Page Break

Q28 Otitis media contributes to which of the following hearing losses?

- [ ] Sensorineural hearing loss (1)
- [ ] Conductive hearing loss (2)
- [ ] Mixed hearing loss (3)

Q29 Which of the following are associated with fluctuating hearing loss?

- [ ] Mixed hearing loss (1)
- [ ] Sensorineural hearing loss (2)
- [ ] Conductive hearing loss (3)

Q30 Which of the following are associated with a permanent hearing loss?

- [ ] Conductive hearing loss (1)
- [ ] Sensorineural hearing loss (2)
- [ ] Mixed hearing loss (3)

Page Break

Q31 Anyone with a hearing loss can benefit from a hearing aid:

- ○ True (1)
- ○ False (2)

Q32 Please provide rationale for your answer above:

_____

Q33 If a client is wearing hearing aids, are they capable of hearing within the normal range?

- ○ Yes (1)
- ○ No (2)

Q34 Please provide rationale for your answer above:

_____

End of Block: KNOWLEDGE OF HEARING LOSS

Start of Block: COLLABORATION

PERSPECTIVE ON COLLABORATION

Q35 What is your understanding of an audiologists role in supporting client's with hearing loss?

_____

_____

_____

Q36 Do you feel that you have received "appropriate" training in the following areas?

	Strongly agree (1)	Agree (2)	Neither agree nor disagree (3)	Disagree (4)	Strongly disagree (5)
Diagnostic audiology (1)	○	○	○	○	○
Aural/ Auditory Rehabilitation (2)	○	○	○	○	○
Hearing aids (3)	○	○	○	○	○
Cochlea implants (4)	○	○	○	○	○
Remote microphone assistive devices (5)	○	○	○	○	○
Understanding how the degree of hearing loss impacts speech? (6)	○	○	○	○	○

Q37 Please include any additional comments related to the above question:

_____

_____

Page Break

Q38 Considering your answers for the previous question, do you feel that training as a speech therapist in the following areas is necessary?

	Strongly agree (1)	Agree (2)	Neither agree nor disagree (3)	Disagree (4)	Strongly disagree (5)
Diagnostic audiology (1)	○	○	○	○	○
Aural/ Auditory Rehabilitation (2)	○	○	○	○	○
Hearing aids (3)	○	○	○	○	○
Cochlea implants (4)	○	○	○	○	○
Remote microphone assistive devices (5)	○	○	○	○	○
Understanding how the degree of hearing loss impacts speech? (6)	○	○	○	○	○

Q39 Please include any additional comments related to the above question:

_____

_____

Page Break

Q40 Describe an experience where you have collaborated directly with an audiologist:

_____

_____

Q41 During this experience, what worked well?

_____

_____

Q42 In relation to the above experience, what didn't work well?

_____

_____

Page Break

Q43 If you are working with a child with hearing impairment, what education or information about hearing impairment or hearing disorders would assist your management plans? (select all that apply)

- ☐ Information about the ear and hearing system (1)
- ☐ Information about how hearing aids work (2)
- ☐ Information about how to trouble shoot hearing aids (3)
- ☐ Information about how implantable devices work (4)
- ☐ Information about communication support strategies for children with hearing aids (5)
- ☐ Information about communication support strategies for adults with hearing aids (6)
- ☐ Other (please describe) (7) _____

Q44 Considering your answers selected for the question above, where would you go to find further information/ resources on this topic? (select all that apply)

- [ ] New Zealand Audiology Society (NZAS) website (1)
- [ ] Kelston/ Van Asch Deaf education centre websites (2)
- [ ] Google (or other search engines) search using key words (3)
- [ ] Refer to a textbook (4)
- [ ] Other (please describe) (5) _____

Q45 How important do you feel 'good communication' between Speech Therapy and Audiology services is?

5 stars = important (4)

Q46 When was the last time you had contact with an audiologist?

- ○ Within the last week (4)
- ○ Within the last month (5)
- ○ Within the last 3 months (6)
- ○ Greater than 3 months (7)
- ○ I don't know (8)

Q47 Using the space below, please provide any recommendations you may suggest to improve communication between the two professions:

_____

End of Block: COLLABORATION

Start of Block: Raffle

Q48 Thank you for taking the time to complete this survey- your time spent on this is much appreciated. If you would like to go in the draw for a gift voucher please tick the appropriate box below:

- ○ Yes, I would like to enter the draw for one of ten $20 gift vouchers. (1)
- ○ No, I would not like to enter the draw. (4)

End of Block: Raffle

7.3 Appendix C: Semi-structured Interview Questions

University of Canterbury
Department of Communication Disorders
Private Bag 4800
Christchurch 8140
New Zealand

Participant Information:
ID _____ Date _____

Semi-structured Interview Questions:

Use the following questions as a guide for the semi-structured interview. Expand on these points as necessary.

1. From the questionnaire responses, there are many Speech Therapists' identifying minimal collaboration between SLT's and Audiologists':
    a. What is your perspective on this?
    b. In your experience could you identify some factors that may be contributing to the limited collaboration between the two professions?
    c. Could you describe the importance collaboration with audiologists would add to your daily work/ case load.
2. How would you describe your current understanding of the referral process to audiology services?
3. What would you find beneficial moving forward in regards to:
    a. Improving collaboration between the two professions.
        i. Barriers to cooperating with Audiology services?
    b. What information about hearing services might support the collaboration?
4. Is the information speech therapists getting enough?
    a. What are the clients hearing with devices on etc- is this information being passed on from the audiologist?
    b. Desired info- what would help support them in their work?
5. Unaided audiogram- do you feel comfortable looking at an audiogram to get an idea of what might be audible/ aided for the client; gives more info is the aid any good?
    - What is identifiable, audible, intelligible?
    - Are they having trouble with receptive language even with the aid?

7.4 Appendix D: Questionnaire Recruitment Advert

Participants wanted for "New Zealand Speech Language Therapists' Knowledge of Hearing Loss and Perspectives on Collaboration with the Audiology Profession" Research:

I am conducting a research project that involves speech language therapists' who are currently working in NZ to complete an online survey exploring their current knowledge and experiences of working with clients with hearing loss. Further, experiences and perspectives on aspects of collaboration with the audiology profession will be explored.

The online anonymous survey can be completed anywhere with wifi access and will take around 15-20 minutes to complete. If you are interested in participating, here is a link to the survey and full study information.

http://canterbury.qualtrics.com/jfe/form/SV_7QbjopOAoZTY07P

If you would like any further information, please contact me at ryah.collinson@pg.canterbury.ac.nz.

7.5 Appendix E: Interview Recruitment Advert

"New Zealand Speech Language Therapists' Knowledge of Hearing Loss and Perspectives on Collaboration with the Audiology Profession" Research:

Kia ora, I am conducting a research project that aims to increase our understanding of speech-language therapists' knowledge and experiences of working with clients with hearing loss and understanding their perspectives on collaboration with the audiology profession.

As part of this project I am looking for speech-language therapists who might be willing to participate in a face-to-face interview to explore these areas of knowledge and experience. Each participant will be offered a $20 fuel voucher to cover any costs associated with your travel to contribute to the study.

If you are interested in participating, please send me an email and I will forward full study information and answer any questions you might have - ryah.collinson@pg.canterbury.ac.nz.

Thank you
Ngā mihi