Exploring the Knowledge and Beliefs About Child Language Development Held by Parents and Caregivers of Deaf or Hard of Hearing Children in New Zealand

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Abstract

Background: For Deaf or hard of hearing (DHH) children, early identification and intervention, and quality linguistic input during early childhood pave the way for optimal language development, educational achievement, and well-being. The decisions parents and caregivers make on behalf of their DHH child are influenced by their knowledge and beliefs. Parent/caregivers knowledge about child language development has been associated with children's language abilities.

Aims: This study set out to examine the knowledge and beliefs about child language development held by parents and caregivers of DHH children in New Zealand. In doing so, it sought to identify (a) groups that may benefit from further support, and (b) specific areas of child language development where parent/caregiver views differ from the current literature base.

Methodology: Data was collected nationwide, via an online qualitative survey. Participants were 36 parents and caregivers of DHH children aged between zero and five years, who were living in Aotearoa New Zealand. Participants responded to demographic questions, followed by a 30-item survey on child language development and hearing needs, named the 'Early Language Development for the Deaf or Hard of Hearing' (ELD-DHH) survey. Participants were asked to indicate how much they 'agreed' or 'disagreed' with each item on a five-point Likert-type scale. The ELD-DHH was based on previous a survey by Suskind et al. (2018). Suskind et al.'s work was designed for typically developing children and not specifically for the New Zealand DHH population. Therefore, thirteen additional items were included, five of which were from an earlier study (Suskind et al., 2016a). Two additional open-text questions captured participant's beliefs about the main influences on, and barriers to DHH children learning to talk and/or sign. These were analysed via thematic analysis.

Results: On average participants' responses, as measured by the ELD-DHH, were reasonably consistent with international literature. However, responses varied considerably within the group. Participant responses aligned closely with the literature on early exposure to learning opportunities, and language development in infants and toddlers. In contrast, responses demonstrated low consistency with the literature base on the predictive power of linguistic input in the home and early vocabulary for later language development and academic outcomes. Participant's views also differed from the literature on the importance of joint attention, high hearing amplification device use (aiming for 'all waking hours'), child directed speech; and parents/caregivers providing the strongest linguistic model through their *home language*. Participants' age and highest reported level of education were correlated with higher scores on the ELD-DHH. Thematic analysis of the open text questions indicated that participants believed the main influences on DHH children's language development were, *access to language; networks of support; language infused interaction;* and *hearing*. Whereas barriers to language development were perceived as; *barriers to accessing services* and *support, barriers to learning NZSL,* and *difficulties with hearing amplification*. Within this question participants also responded with, *facilitators of DHH children's language development*, and others reported experiencing *no barriers*.

Conclusions: Alignment of participant knowledge and beliefs with international literature varied within the group, and between specific areas of child language development. Many participants valued the and services and supports they had received, and others indicated the need for better access to these. Findings may indicate the need for (a) individualised educational support for parents and caregivers (b) education on specific topics where parents and caregivers of DHH's knowledge and beliefs differed considerably from the international literature base on DHH children's language development.

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Table of Contents

List of Figures

List of Tables

Abbreviations

AoDC	Advisers on Deaf Children
AABR	Automated auditory brainstem response
ABR	Auditory brainstem response
ASHA	American Speech-Language-Hearing Association
BCHA	Bone conduction hearing aid
CBR	Centre for Brain Research
CI	Cochlear implant
DND	Deafness Notification Database
dBA	A-weighted decibels
dB HL	decibels hearing level
DHH	Deaf or hard of hearing
DPOAEs	Distortion product otoacoustic emissions
EBP	Evidence-based practice
EHDI	Early Hearing Detection and Intervention
HA	Hearing aid
HHP	Hearing hour percentage
KIDI	Knowledge of Infant Development Inventory
LENA	Language Environment Analysis
LOCHI	Longitudinal Outcomes of Children with Hearing Impairment
MLU	Mean length of utterance
MELAA	Middle Eastern, Latin American, and African
NZSL	New Zealand Sign Language
NZQA	New Zealand qualifications framework
PHO	Primary health organization
SES	Socioeconomic status
SLT	Speech language therapist
UNHSEIP	Universal newborn hearing screening and early intervention programme
US	United States
WHO	World Health Organisation

Exploring the Knowledge and Beliefs About Child Language Development Held by Parents and Caregivers of Deaf or Hard of Hearing Children in New Zealand

Early access to language rich experiences assists DHH children to achieve their full potential. World Health Organisation (WHO) (2021) states that a person who is 'deaf' has a profound degree of hearing loss, meaning very little to no hearing. Whereas a person who is 'hard of hearing' has a hearing loss ranging from mild to severe. Great progress has been made for the outcomes of DHH children, however, they continue to face significant challenges (Ching et al., 2018). Paediatric hearing loss has been associated with delayed language and cognitive development, as well as poorer psychosocial development; academic achievement; literacy; and vocational prospects (Digby et al., 2004; Krug et al., 2016; Schrijver, 2004). Poorer language outcomes are predominantly due to reduced access to language (spoken or sign) during the critical period for language acquisition, a child's first three years of life (Mayberry et al., 2002).

Parents and caregivers play a fundamental role in the early language development of DHH children. Given the close proximity and time spent together, they are ideally placed to be their child's best teacher (Zauche et al., 2017). Many parents believe they are pivotal in their DHH child's care and intervention (Erbasi et al., 2018). Importantly, their knowledge and beliefs may underpin their decision making about their child's hearing and linguistic needs (Porter et al., 2018). It is therefore logical that education and training around language development and providing language rich environments is targeted at parents and caregivers of young children (Zauche et al., 2017). It is beneficial for parents/caregivers to hold sound knowledge of child language development and hearing needs (Rowe et al., 2016; Suskind, et al., 2016b). However, 90 to 95% of DHH children are born to hearing parents, who may have no prior experience or knowledge of hearing loss (DesGeorges, 2016; Porter et al., 2018).

Many parents and caregivers are entering unchartered waters following their baby or child's diagnosis.

Mediators of language delay for DHH children include early identification and intervention, quality and quantity of parent-child interaction, and hearing amplification device wear time (Ching et al., 2018; Gagnon et al., 2020; Hart & Risley, 1995; Park et al., 2019; Yoshinaga-Itano et al., 1998; Zauche et al., 2017). Parent level of education and socioeconomic status are also associated with disparities in language outcomes (Hart & Risley, 1995). Higher levels of parent and caregiver knowledge of child language development are associated with language enriching interaction styles and increased child language abilities. Furthermore, this knowledge has been demonstrated to mediate risk factors for language development such as socioeconomic deprivation (Alper et al., 2021; Rowe et al., 2016). Importantly, language abilities are the strongest predictor of academic success for DHH children (McKee & Smiler, 2016). Parent and caregiver knowledge likely influences their daily decision making and these decisions can go on to impact their child's language development and later outcomes (Digby et al., 2004; Krug et al., 2016; Porter et al., 2018; Schrijver, 2004). Research indicates that when parents/caregivers gain greater understanding of child language development and the power of linguistic input in a child's first few years of life, parenting behavioural changes may occur (Sowa et al., 2021; Suskind et al., 2016b).

Hearing Loss

World Health Organisation (WHO) reports that approximately five percent of the world's population live with disabling hearing loss. This equates to 360 million people globally, with 32 million of these being children (World Health Organisation, 2021). Disabling paediatric hearing loss is defined by thresholds greater than 30 dB HL in the better ear (Yoshinaga-Itano et al., 1998). Hearing loss can be classified by type, severity,

configuration, and time of onset. Type of hearing loss refers to the location along the auditory pathway at which a problem occurs. It can be described in one of three ways: conductive (occurring in the outer or middle ear), sensorineural (occurring in cochlea portion of the inner ear, or from the auditory nerve to the brain), or mixed, a combination of both conductive and sensorineural hearing loss (Katz, 2015). In describing the degree of hearing loss, the New Zealand Audiological Society (NZAS) recommends use of Clark's (1981) ASHA severity codeframe (Digby et al., 2021). This scale categorises hearing loss (in DB HL) within a range from normal (-10 to 15 dB HL) to profound (90+ dB HL) and is displayed in table 1.

Table 1

Classification for Degree of Hearing Loss (Clark, 1981)

Degree of hearing loss	Hearing loss range (dB HL)
Normal	-10 to 15
Slight	16 to 25
Mild	26 to 40
Moderate	41 to 55
Moderately severe	56 to 90
Severe	71 to 90
Profound	91+

Note. Adapted from: Digby, J., Purdy, S. C., & Kelly, A. S. (2021). Deafness Notification Report (2020) Hearing loss (not remediable by grommets) in New Zealanders under the age of 19. dB HL = decibel hearing level.

The configuration or shape of hearing loss is used to describe frequency specific thresholds, as they are positioned in relation to one another. Examples of configuration descriptors are ‘flat’, where there is minimal change in thresholds between frequencies, ‘sloping’, where hearing thresholds decline (hearing gets worse) between low and high frequencies, or ‘rising’, where the opposite occurs (Katz, 2015).

Time of onset refers to the time at which the hearing loss occurred and can be either congenital or acquired. A congenital hearing loss is present at birth, whereas an acquired

hearing loss is diagnosed postnatally or later in childhood. Other terms relating to time of onset are prelingual, and postlingual. These refer to whether hearing loss has occurred prior to the child developing language (prelingual), or after the development of language (postlingual) (Cowie & Douglas-Cowie, 1983).

Paediatric Hearing Loss Prevalence in New Zealand

Hearing loss is the most common congenital abnormality in New Zealand (Digby et al., 2004). Three in every 1000 babies are born with a moderate to profound, permanent hearing loss. This translates to up to 70 DHH infants born annually (Ministry of Health NZ, 2018) and is in line with international statistics for developed countries (Morini et al., 2017). The Deafness Notification Database (DND) (Digby et al., 2021) reports annually on DHH children and young people, aged zero to 18 years with permanent unilateral or bilateral hearing loss. The DND received 188 notifications of hearing loss diagnoses over the reporting period for 2020. Note, historically this number has been seen to increase post initial reporting, as a small number of late notifications are often received. Since 2010 annual notifications have ranged from 184 (2014) to 212 (2017).

Implications of Hearing Loss

Paediatric hearing loss has adverse effects on language, cognitive, and psychosocial development, as well as academic achievement, literacy, and vocational prospects (Digby et al., 2004; Krug et al., 2016; Rowe, 2008; Schrijver, 2004). Language development warrants emphasis as being fundamental to outcomes of other identified developmental domains. Language provides children with the ability to communicate, interact with, and learn from others. This enables both the cognitive and social development required for literacy development and engagement in education once children reach school (Hart & Risley, 1995; Zauche et al., 2017). Based on work by McKee and Smiler (2016), Fitzgerald & Associates (2019) described language acquisition as “the most powerful predictor for educational

outcomes for deaf [or hard of hearing] children" The association between early language abilities and later academic and social outcomes for DHH children and children with normal hearing has been demonstrated through numerous studies (Hart & Risley, 1995; Rowe, 2008; Zauche et al., 2017). For children to acquire spoken language, audible access to that language is a necessity.

Great progress has been made with early identification and intervention, and with advances in hearing amplification technology. Nonetheless, DHH children continue to face challenges (Lieu et al., 2020). A Ministry of Education report cited by Fitzgerald & Associates (2019), examined the language abilities of a sample of 100 New Zealand DHH children aged between four and a half and five years old, who were receiving a range of supports. Of the sample, 48% demonstrated age appropriate (or above) language abilities, and language development was not significantly delayed for 18% of these children. This suggests that over half the sample had language abilities below what was expected for their age, and roughly 30% had significant language delays. There is limited New Zealand data available for this population therefore, a secondary source has been relied on in this case. As part of the Longitudinal Outcomes of Children with Hearing Impairment (LOCHI) study in Australia (Dillon et al., 2013), 339 DHH five-year-old children's scores on language assessments (PLS-4, PPVT-4 and DEAP) fell approximately one standard deviation below the mean of typically developing children (Cupples et al., 2018a).

The degree to which a child is affected by their hearing loss depends partly on the severity of hearing loss (Ching et al., 2010, 2018; Krug et al., 2016; Yoshinaga-Itano et al., 2017). Severity of hearing loss impacts significantly on language outcomes. Ching et al. (2010) reported on the language abilities of 133 DHH children aged three-years-old, who were enrolled in the LOCHI study. They found that mean scores of language development decreased as severity of hearing impairment increased. Similarly, Yoshinaga-Itano et al.

(2017) found that children with mild or moderate hearing loss performed better on measures of vocabulary than children with more severe hearing losses. However, disparities in language development are seen in cases of even mild hearing loss, particularly affecting language form (Walker et al., 2020).

Additional Disabilities

Digby et al. (2021) reported that additional disabilities are more common for DHH than for those with normal hearing. This is likely because many risk factors for hearing loss are also associated with other conditions. Additional disabilities are difficult to define due to the wide range of conditions and their presentations, many of which are not discernible at the time of hearing loss diagnosis (Nelson & Bruce, 2019). Comparisons with other countries are also problematic due to differences in the way additional disabilities are defined. As part of the LOCHI study, Cupples et al. (2018b) determined that the absence of additional disability was associated with better language outcomes for DHH children at five years of age. Higher level of maternal education; less severe hearing loss; higher cognitive ability; earlier hearing aid fittings; and intervention for spoken language only, were all associated with better language outcomes for DHH children with additional disabilities.

Perspectives on Deafness and Hearing Loss

Parents and caregivers of DHH children face important decisions regarding language options for their children. However, the choice need not be binary between sign language or hearing aids (HA)/cochlear implants (CIs) and spoken language. In some cases, such as findings from Scarinci et al.'s (2018) Australian based qualitative research, participants (n = 7) valued a combination of spoken and sign language for their DHH children. However, all identified spoken language as their child’s primary mode of communication. Scarinci et al. suggest that communication choices can be flexible and change over time.

Even with an open-minded approach to language choice, the beliefs of the Deaf community and the medical field can seem at odds with one another. Senghas and Monaghan (2002) describe two views of Deafness: a sociocultural view and an audiological view. A sociolinguistic view sees Deafness as part of cultural and linguistic identity. The term Deaf with a capital D is used by people who identify as culturally Deaf, communicating most often in sign language and who belong to the Deaf community. An audiological view perceives deafness (lowercase d) as an impairment that requires treatment or management. Medical and audiological interventions are undertaken with the aim of providing DHH children with access to audible sound so that they may develop spoken language. However, the two views are not independent of one another, as is evidenced by the use of d/Deaf and h/Hearing, by those discussing the complexity of sociolinguistic and audiological conditions (Senghas & Monaghan, 2002).

Decker et al.'s (2012) US based study included 35 DHH children of whom, 20 used spoken language, three sign language, and 12 spoken and sign language to communicate with their parents. Of the 36 parents in the study, 30 were hearing, and six were DHH. Findings suggested that parents with sociolinguistic views of Deafness were more likely to include the use of sign language with their child, while those with audiological views were more likely to choose spoken language.

Haug and Mann (2008) reported that there are insufficient appropriate assessments of children’s sign language development. As a result, attempts had been made at adapting the few existing measures of American Sign Language and British Sign Language for use in other countries. In New Zealand, the National standardised ‘*Assessing NZSL Development toolkit*’ for children aged three to 11 years was rolled out in 2018 (NZSL Board, 2018). However, there is no publicly available data from this assessment at present. Due to the limited data on sign language development in young children, the present study has focused

on literature for spoken language development in both DHH children and children with normal hearing. The researcher strives to remain neutral, taking neither an audiological nor sociolinguistic view of Deafness, but advocating strongly for early access to language or languages of any modality. The emphasis is on the crucial importance of early access to language, whether this is New Zealand Sign Language (NZSL), spoken language, or a combination of both. Earlier access to language of any modality is associated with better language outcomes (Ching et al., 2018; Mayberry et al., 2002).

Hearing Screening Programmes

In New Zealand, infants and children at risk of hearing loss are identified in the following ways: the universal newborn hearing screening and early intervention programme (UNHSEIP), B4 School Check, or developmental concerns raised by family, whānau, teachers, family doctors, SLTs or other health or educational professionals. A referral is then made to Audiology and hearing loss can be diagnosed or ruled out by an audiologist (Ministry of Health, 2016c, 2016b).

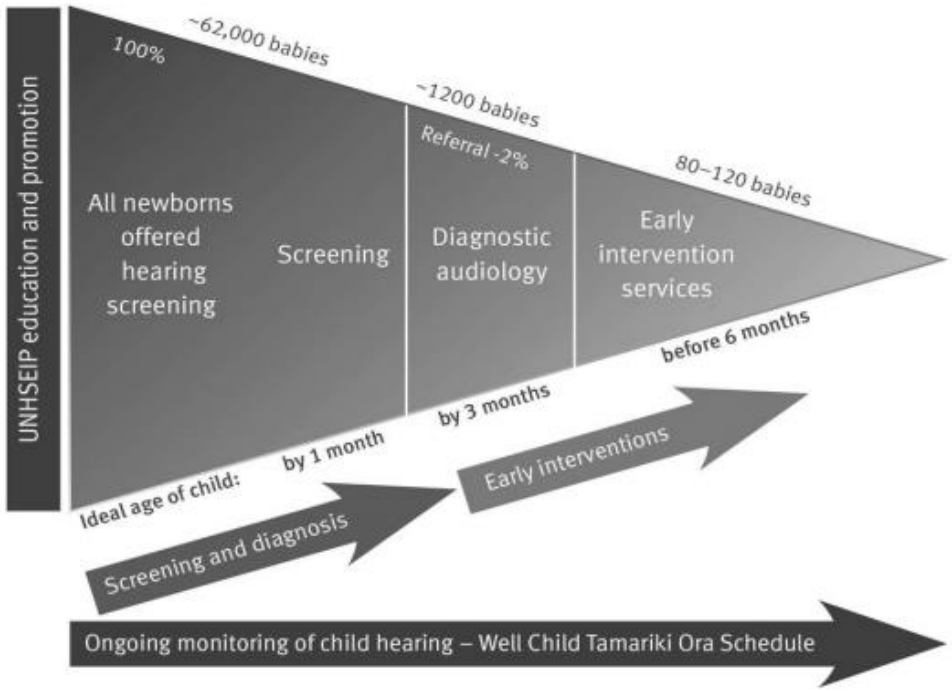
UNHSEIP. The UNHSEIP was rolled out across New Zealand between 2007 and 2010. The programme aims to provide early diagnosis and intervention for DHH newborns, resulting in improved outcomes for these children, their whānau, and society. To achieve this, the programme aims to screen every baby born in New Zealand by one month old, have a diagnostic hearing assessment completed by three months old, and have intervention in place before six months old. These aims are referred to as the ‘1-3-6’ goals (Ministry of Health, 2016c). In 2005, prior to the UNHSEIP, the average age of diagnosis for a DHH child was three years nine months. By 2012, two years after the implementation of the UNHSEIP, the average age of diagnosis had been successfully reduced to five months (Digby, 2013).

Newborn hearing screening can be conducted once an infant is 24 hours old and can take place in hospitals, outpatients, birthing centres, and/or outreach programmes. In New

Zealand it is conducted using an automated auditory brainstem response (AABR). This testing procedure is highly sensitive and has specificities of above 95%. AABR screening results in a referral rate of 1.5% of infants referred for diagnostic audiological examination. 12% of these referrals result in a diagnosis of permanent congenital hearing loss (Ministry of Health, 2012). Diagnostic audiological examination of infants utilises several objective assessments and crosschecks including tympanometry, distortion product otoacoustic emissions (DPOAEs), and auditory brainstem response (ABR) which provides an estimate of the infant's hearing thresholds. ABR can be used to diagnose hearing losses that are moderate to profound in severity (Katz, 2015). Infants with hearing losses in the slight and mild range are not identified at this stage. Figure 1 displays UNHSEIP Pathway including the '1-3-6' goals.

Figure 1

Overview of the UNHSEIP Pathway



Note. From the Ministry of Health. (2016). Universal Newborn Hearing Screening and Early Intervention Programme: National Policy and Quality Standards.

B4 School Check. The B4 School Check was rolled out across New Zealand in 2008. It is offered to all families, as their child turns four years old, and aims to identify health, developmental or behavioural concerns (Ministry of Health, 2016b). Children's hearing is screened as part of this check. This is the second measure, following the UNHSEIP, that aims to prevent the adverse impacts of hearing loss on a child's language development and learning. Play audiometry, a type of behavioural audiometry appropriate for this age group (Katz, 2015), is used to screen each four-year-old child's hearing. Each ear is screened at 30 dB HL and 20 dB HL across the four frequencies most important for understanding speech; 500 Hz; 1,000 Hz; 2,000 Hz; and 4,000 Hz (Ministry of Health, 2021). The B4 School Check hearing screen, therefore, has the sensitivity to pick up mild hearing losses that are missed by the UNHSEIP. Children who do not respond to all four frequencies at 20 dB HL are referred for diagnostic audiological assessment. Data from July 2016 shows that the B4 School Check was completed for 92% of the eligible population (Ministry of Health, 2016a). However, five percentage of children aged zero to four years are not registered with a primary health organisation (PHO) and are therefore not included in this data. Parents/caregivers of these children may be unaware of the benefit or even existence of the B4 School Check, as appointment notifications are made to families through either their PHO or early childhood education provider. B4 School Check attendance rates were analysed over a four-year period (2011 to 2015), with lower participation rates found for children from areas of socioeconomic deprivation, with poorer health status, and with younger mothers, among other factors. Lower participation rates were also seen for Māori and Pacific children, compared with non-Māori and non-Pacific children. This lack of service to already vulnerable populations is likely to perpetuate existing disparities (Gibb et al., 2019).

Interventions for DHH Children

Intervention for paediatric hearing loss can be a linguistic, audiological, or medical approach and is often a combination of two, or of all approaches (World Health Organisation, 2021). This depends on the severity and nature of the hearing loss as well as the family's choice. Some outer and middle ear pathologies can be partially or fully ameliorated through surgical intervention such as tympanostomy tubes (grommets) (Cole & Flexer, 2020). HAs are a common intervention for paediatric hearing loss. They are electronic devices, worn in or on the ear, that amplify sound to an audible level for the wearer. They can be worn by people of any age including infants. Acoustic HAs are the most prescribed type of HA and they amplify sound via air conduction. For some outer and middle ear pathologies, bone conduction hearing aids (BCHA) are more appropriate, and as their name suggests, they amplify sound via bone conduction. BCHA's can be worn on a soft band or are surgically implanted into the bone of the skull once the child is old enough. When HAs are unable to provide adequate amplification due to the severity or nature (e.g., auditory neuropathy spectrum disorder ANSD) of the hearing loss, CIs are considered. CIs are electronic devices which are surgically implanted through the skull and into the cochlea. An electrode array sits within the cochlear and provides an electronic signal to the auditory nerve, which the brain interprets as sound. A processor sits externally on the child's ears and looks similar to a HA (Katz, 2015). When a DHH individual is not wearing their cochlear implant processor or HA, their hearing ability is at their unaided thresholds.

DHH children and their families receive support from multiple disciplinary teams which may include otorhinolaryngologists; paediatricians; audiologists; genetic services; advisers on Deaf children (AoDC), SLTs; First Signs facilitators; and other specialist services, depending on the child and family's needs (First Signs Deaf Aotearoa, n.d.; Lieu et al., 2020; Ministry of Education, 2021). Otorhinolaryngologists are concerned with the

medical and surgical management of hearing loss, and paediatricians with the child's health and global development. Audiologists conduct hearing assessments and provide intervention through hearing amplification devices (Katz, 2015). Genetic services may be involved when an underlying genetic cause of hearing loss is suspected (Schrijver, 2004).

AoDC are employed by the Ministry of Education and work with DHH children and their families and whānau from birth to eight years old. The Ministry of Education (2021) website states that AoDC work in a "family and whānau centred way" and provide guidance on communication development. There is no publicly available independent review of the AoDC service.

First Signs is a free nationwide service provided by Deaf Aotearoa and is offered to all families and whānau of DHH children aged zero to five years. The organisation describes itself as being family centred and providing opportunities for families to learn NZSL alongside their DHH child. They offer weekly or fortnightly sessions with a First Signs facilitator and work closely with other service providers. The First Signs service is available to families regardless of whether their child utilises a hearing amplification device (First Signs Deaf Aotearoa, n.d.). An evaluation of First Signs (Fitzgerald & Associates, 2019) determined that the service has a significant social impact on the children and families it supports, and on the language development, wellbeing, and identity of DHH children. Recommendations for improvements were - an increase in the flexibility and frequency of the service, and more training in family centred approaches and diplomacy (respecting parents' choices) for some facilitators. A further critique of the service was that intervention focused heavily on learning colours, alphabet letters, and animal names rather than more functional language. While the service introduces whānau to NZSL it may not extend beyond basic signs. At the time of this evaluation, First Signs was being accessed by approximately 17% of DHH children also receiving an AODC service.

In combination with HAs or CIs, intensive SLT is recommended to achieve better outcomes for DHH children (Lieu et al., 2020). Publicly funded SLT support is available for all children who receive CIs, through the northern and southern CI programmes. There is no public SLT support specific to children with hearing aids. The need for SLT support is determined in the same way for DHH children as it is for children with normal hearing (Ministry of Education, 2019). Families of DHH children who are not eligible for public SLT services may choose to self-fund private SLT support for their child (New Zealand Speech-language Therapists' Association, 2018).

There are a wide range of interventions and services available to DHH children and their family and whanau. The most appropriate intervention/s are determined by the medical, audiological, and developmental needs of the child and the preferences of their family. It may also depend on the services available, which can vary based on geographic location, for example, major centres versus rural locations (Goodyear-Smith & Ashton, 2019). Parents and caregivers may choose for or against engaging with these services. Their knowledge of DHH children's language development and hearing needs is likely one influencing factor in this decision.

Risk Factors Associated with Child Language Outcomes

SES is an associated risk factor for language outcomes for children with normal hearing (Ginsborg & Clegg, 2006; Hart & Risley, 1995; Zauche et al., 2017) and DHH children (Digby et al., 2021). Common measures of SES include parental or maternal education, household income, and income to need ratio (Pace et al., 2016).

SES by Income

A landmark US study by Hart and Risley (1995) estimated, through extrapolation of their data, that children from lower SES households (receiving welfare support) experience thirty-million fewer words spoken to them in the home by age four, in comparison with

children from more privileged households. Furthermore, the quality and quantity of linguistic input that children received between birth and three years was predictive with their vocabulary skills at three years, and vocabulary and reading ability at nine years of age. The longitudinal nature of this study revealed that differences in talk in the home fully mediated the relationship between SES and differences in children's vocabulary.

In contrast to these findings, in a study of 133 DHH children aged three-year-old, a correlation between SES and language performance was not indicated (Ching et al., 2010). For this study, parents were asked to complete the Parents' Evaluation of Aural/oral performance of Children (PEACH) (Ching & Hill, 2007) and the Child Development Inventory (CDI) (Ireton, 2005). Children's language was further assessed by a qualified SLT via standardised formal assessments of speech and receptive and expressive language development. A limitation of their study was that SES was determined by participants' postcodes rather via individual measures such as household income. The authors noted that once further data from the LOCHI study came available it may be possible to more accurately determine risk or protective factors for DHH children's language development. In later publications from the LOCHI study (Ching et al., 2018; Cupples et al., 2018) SES was not reported however, Ching et al. (2018) advocated for further research into improving language outcomes for DHH children with mothers from lower SES backgrounds or who had not completed university.

There are a number of potential explanations for Ching et al. (2010) finding no correlation between SES and child language abilities in their sample of DHH children. The first relates to their participant sample, which may have been skewed toward families with high SES or may have had too limited variance in SES for any difference to be significant. Their findings could also indicate that while SES is associated with child language outcomes in the general population, more powerful factors may be at play for DHH children, therefore

masking the effect of SES on language development. A final and encouraging alternative is that the intervention and supports provided to the children and their families in LOCHI study may have mitigated any SES differences. Intervention studies that have been targeted at DHH children and families from low SES households have aimed at achieving such outcomes (Sowa et al., 2021; Suskind et al., 2016b).

SES by Parent/Caregiver Level of Education

SES and parent/caregiver level of education are interconnected, and it can therefore be difficult to tease the two apart. As mentioned above, maternal education is often used as a measure of SES (Pace et al., 2016). Better education is associated with better individual health outcomes (Zauche et al., 2017) but is also true for parental education and their children's outcomes. Parental level of education is associated with language development for both children with normal hearing (Alper et al., 2021; Dollaghan et al., 1999) and those who are DHH (Ching et al., 2018; Digby et al., 2021; Yoshinaga-Itano et al., 2017).

Yoshinaga-Itano et al. (2017) found that DHH children who had mothers with higher levels of education had significantly higher scores on measures of vocabulary. Findings from the LOCHI study revealed that higher levels of maternal education were positively correlated with an increase in language performance at the age of three years, and were a mediating factor as hearing loss severity increased (Ching et al., 2010). Again at age five, for the same children, better outcomes were associated with higher maternal education levels (Ching et al., 2018). These findings can likely be explained by the phenomenon that more educated parents talk more and provide more language rich experience for their children than parents with less education (Hart & Risley, 1995). Importantly, it appears disparities in children's language abilities are not caused by SES, but specifically by the variation in children's early language environments between socioeconomic groups (Zauche et al., 2017).

In New Zealand, having no qualifications and receiving a means tested benefit (measures of education and income) are two of the nine measures contributing to the New Zealand Index of Deprivation 2018 (Salmond et al., 2019). People experiencing socioeconomic deprivation in New Zealand may be more vulnerable to environmental factors such as poor quality housing and may not have access to transport to attend health care appointments. Families struggling to have their basic needs met, may not have the time or capacity to prioritise providing language rich experiences for their young children. Furthermore, some families may not understand the importance of early language acquisition and may therefore not focus attention and efforts in this area.

Parent/Caregiver Age

Overseas research has demonstrated a positive relationship between maternal age and general child development, including language development (Falster et al., 2018; Leigh & Gong, 2010). A New Zealand based study indicated children born to older mothers were more likely to experience stable and supportive home environments, and better educational achievement and mental health (Fergusson & Woodward, 1999). New Zealand Children of younger mothers are also less likely to attend their B4 School Check, compared with children of older mothers (Gibb et al., 2019).

Mediators of Language Delay in DHH Children

The factors that influence successful language outcomes for DHH children are many and complex. Three key elements stood out within the literature. These were early diagnosis and intervention, quality and quantity of parent-child interaction, and hearing amplification device use (Ching et al., 2018; Gagnon et al., 2020; Hart & Risley, 1995; Park et al., 2019; Yoshinaga-Itano et al., 1998; Zauche et al., 2017).

Early Identification and Intervention

Early identification and intervention lead to significantly better language outcomes for DHH children (Ching et al., 2018; Digby et al., 2004; Yoshinaga-Itano et al., 1998, 2017). But why is it so important to act early? The early years of a child's life are a critical period for language development. Even within these first few years, earlier exposure to language is associated with better language abilities (Mayberry et al., 2002). Infants' brains are primed for language even before birth. Synaptic growth associated with language development peaks at an approximate age of just six months old (Shonkoff & Phillips, 2000).

A large cross-sectional study of 488 DHH children in the US by Yoshinaga-Itano et al., (2017) found that children who met the Early Hearing Detection and Intervention (EHDI) guidelines of 1:3:6, achieved significantly higher vocabulary quotients than those who did not meet the guidelines. However, they found that on average this group still achieved below the expected vocabulary quotient, with 37% falling into the 10th percentile, despite having met EHDI guidelines of 1:3:6. Children in the study were aged between eight and 39 months and had bilateral hearing loss. Participants included children with additional disabilities which were considered likely to disrupt language development. Measures of vocabulary were in spoken (English or Spanish) or sign language and were determined via the MacArthur-Bates Communicative Development Inventories.

Important findings from the LOCHI study, a longitudinal study with DHH children in Australia (Ching et al., 2018), demonstrated that earlier amplification with either HAs or CIs was associated with better language, speech, and functional outcomes. Higher language and functional skills were also associated with better psychosocial development. For children with cochlear implants, language outcomes at five years consistently improved, the earlier they were implanted (five months being the earliest age of implantation in this study). Participants in this study were 470 DHH children, including children with additional

disabilities. Language skills were documented at a number of time points between receiving HAs/CIs (at no later than three years old) and five years old. Language ability, speech production and speech perception were assessed using a range of measures and combined to establish global language scores. These were measures of spoken language only. Higher global language scores were associated with earlier fitting on HAs/CIs. This longitudinal study compared children's language and functional outcomes by age of amplification. No comparison was made with same age children who did not receive hearing amplification.

Parents' and caregivers' choice to engage in early identification and intervention is likely influenced by their knowledge and beliefs (Porter et al., 2018). Families who are aware of the importance of timely intervention may make it their priority in the early years, whereas families who do not hold this knowledge may not.

Quality and Quantity of Parent-Child Interaction

For optimal language and cognitive development to be achieved, children require language-rich environments in their early years (Zauche et al., 2017). This concept is represented by the term *language nutrition*. Zauche et al.'s (2017) integrated review of the literature published between 1990 and 2014, explored the influence of early language nutrition on language and cognitive development. The review included an analysis of 103 studies, determining that "quantity and quality of talking, interacting, and reading with a child in the first three years of life are strongly associated with language and cognitive development as well as school readiness and academic performance" (Zauche et al., 2017). Furthermore, the quality and quantity of linguistic input children received during this critical period was a stronger predictor of children's language and early literacy skills than ethnicity, SES, or parental level of education.

Anderson et al. (2021) completed a meta-analysis of 52 studies examining the association between the quality and quantity of parental linguistic input and child language

development. Both quality and quantity were determined to be significantly associated with child language skills. While both were important, a larger effect size was demonstrated for quality of linguistic input (r = .33) over quantity (r = .20). Quality was measured by vocabulary diversity and syntactic complexity, and quantity by number of words, tokens, or utterances. Highlighting the importance of early language nutrition, children's linguistic experiences in their first three years of life are predictive of vocabulary skills at three and nine years of age, even when controlling for SES and ethnicity (Hart & Risley, 1995).

Shneidman et al. (2013) investigated adult linguistic input for children from age two years six months, and vocabulary development for the same children at three years six months. Participants were 30 US monolingual families and data was collected in their homes via 90-minute video recordings every four months. Based on language samples from the 90-minute recording at two years six months, no significant difference was noted between children's expressive language abilities. Children's hearing status and the presence or absence of disability were not noted. The Peabody Picture Vocabulary Test (PPVT) (Dunn & Dunn, 1997) was used to assess children's vocabularies at three years six months. Child directed speech was revealed to be predictive of later vocabulary, whereas overheard speech was not. This was true for children who spent most of their time with their primary caregivers, and for children who were frequently around multiple adults. Higher quantity of child directed speech was associated with better language development, and child directed speech from multiple adults was associated with more varied vocabulary. Language samples were collected in children's natural environment and families were asked to interact as they normally would. However, it is not noted the time of day, the type of activities families were engaged in during the video recording, or whether these factors varied between families.

In slight contrast to these findings, research in a laboratory setting has demonstrated successful word learning by children aged two years from overheard speech between two

adults. However, the essential condition for word learning from overheard speech to occur was joint attention between the adults. When one adult was not attending to the other, word learning did not occur (Fitch et al., 2020). The work by both Shneidman et al. (2013) and Fitch et al. (2020) highlights that language learning occurs in the context of social relationships.

Researchers have found that an increase in caregiver's directive utterances is associated with poorer language outcomes for both children with normal hearing (Ambrose et al., 2015; Rowe, 2008) and DHH children (Ambrose et al., 2015; DesJardin et al., 2014). In a US study, Ambrose et al. (2015) found that caregivers of DHH children (n =156) used more directive utterances than caregivers of children with normal hearing (n = 59), at 18 months of age. For the same sample at three years of age, DHH children received poorer quality language input across all measures, and were exposed to fewer words, than children with normal hearing. For both the DHH children and children with normal hearing, quality but not quantity of language input was positively associated with child language abilities at age three years, as determined by standardised language assessment the Comprehensive Assessment of Spoken Language (CASL) (Carrow-Woolfolk, 1999). Quality of language input was measured by proportion of directive utterances, number of different words, mean length of utterance (MLU) in morphemes, and proportion of high-level utterances. The authors noted that the caregivers of DHH children may have been reducing the complexity of their language in response to their child's language ability. While caregivers may have been being responsive to their children's developmental level, language models need to be sufficiently complex to allow for linguistic growth. A limitation of this study is that while caregivers' education levels were comparable in each group, the recruitment process for the caregivers of children with normal hearing was unclear. Furthermore, language samples for the caregiver-child dyads were collected over a short period (five minutes) and were not collected in the

child's natural environment. These factors could have altered the usual interaction been caregiver and child.

A study in the Netherland Dirks and Rieffe (2019) determined that parent-child joint engagement and emotional availablability were positively correlated with children's language abilities in both children with moderate hearing loss (n = 25) and children with normal hearing (n = 26). Children were aged between 29 and 45 months old and had no additional disabilities. Measures of emotional availability between DHH children and children with normal and their parents were mirrored between the two groups. However, parents and their DHH children achieved shorter periods of joint engagement and had more difficulty establishing joint engagement than did the parents and children with normal hearing. An explanation for these differences could be the lower language abilities of the children with moderate hearing loss leading to less frequent and shorter periods of joint engagement. While parents in both groups demonstrated equal emotional availability, children with moderate hearing loss may have had more difficulty identifying their parent's attempts at engagement. Less experience with successful and prolonged joint engagement may lead to further difficulties establishing join engagement.

The findings from these studies clearly demonstrate the importance of language rich experiences in a child's first three years of life for both children with normal hearing and DHH children.

Hearing Amplification Device Use

Children are recommended to wear their HAs or CIs 'all waking hours', to maximise access to spoken language. Data logging is now a standard feature on hearing amplification devices and provides clinicians with information on daily hours of device use. Comparisons between data logging and parent report have determined that parents regularly over report device wear time (Gagnon et al., 2020; Park et al., 2019). Data logging is a highly useful tool,

as even in cases of mild hearing loss, increased HA use is significantly associated with higher listening comprehension scores (Walker et al., 2020).

A retrospective analysis of the language skills of 40 three-year-old children with CIs revealed ‘age at full-time use’ to be a better predictor of receptive and expressive language skills than ‘age at surgery’ (Park et al., 2019). Gagnon et al. (2020) examined data logging as a predictor of spoken language ability in 37 children under five years old, at one year following cochlear implantation. Gagnon et al. noted that it is often assumed that once prescribed, hearing devices are worn full time. However, device use is often low in infancy, a critical period of language development. They went on to described that while ‘full time use’ is the target, this is based on a generic eight to 10 hours of device use per day. As paediatric audiological support starts at birth and continues to 21 years of age, eight to 10 hours is insufficient to cover this age range and their waking hours. Taking the inverse of the median recommended sleeping hours from birth to five years of age, Gagnon et al. calculated average waking hours by age. Hearing hour percentage (HHP) based on average waking hours by child age (HHP = (total wear time/average waking hours by child’s age)*100), was developed as a more precise measure of full-time device use than the eight-to-ten-hour range cited in the literature. A HHP of 85 to 115% was considered within normal limits. Results of the study were that children had an average HHP of 63% and HPP ranged from 18 to 177%. HPP demonstrated predictive power for receptive but not for expressive language development, one year following implantation. The authors acknowledged that achieving high CI processor wear time is challenging for young children and their families. Even when achieving HHP of 85% or above, a small number of children still exhibited low receptive language abilities. This along with the challenges of achieving early fulltime device use, led the authors to conclude that following cochlear implantation, full time device use is fundamental but is just one of a multitude of factors needed for successful language development to occur.

Longitudinal research is needed to determine whether HHP can predict receptive language beyond one year and expressive language given more time. All children in the study received their CI before five years of age, with an average age at implantation of 1.97 years. However, no controls were put in place for the variability in age of implantation, and therefore this is a limitation. Both early age of implantation and achieving high device use are essential for providing DHH access to spoken language during the critical period of language acquisition (Park et al., 2019).

While it is best practice for children to wear their devices 'all waking hours', it takes considerable effort and ongoing monitoring on the part of parents. It is far from as simple as putting the device on in the morning and taking them off at night, as many young children will remove their HAs/CI processors multiple times a day. However, these efforts are imperative as low device wear time can cause auditory deprivation thereby reducing a child's access to spoken language, which has been demonstrated to lead to speech and language delays (Gagnon et al., 2020). Knowledge of the importance of achieving high device use may mediate parent's/caregivers' efforts to keep their child consistently wearing their HAs/CI processors.

Parent and Caregiver Knowledge about Child Language Development

A US experimental study by Alper et al. (2021) examined developmental knowledge and self-efficacy in relation to children's language abilities in 30 mother-child dyads from low-income households. Children were an average age of 19.2 months old (standard deviation (SD) = 4.09). Their language was assessed using the Preschool Language Scales–Fifth Edition (PLS-5) (Zimmerman et al., 2011). Child receptive and expressive language scores were significantly associated with higher levels of maternal knowledge on a 35-item adapted version of the Knowledge of Infant Development Inventory (KIDI) (MacPhee, 1981). Furthermore, developmental knowledge mediated the effect of SES on children's

language abilities. Alper et al. also examined the relationship between maternal knowledge, self-efficacy, and child language abilities, finding large effect sizes. Self-efficacy was positively associated with child language scores only when mothers held approximately average or above average developmental knowledge. Conversely, self-efficacy in the context of significantly below average developmental knowledge was negatively associated with child language scores. The lowest language scores were present for children whose parents demonstrated low developmental knowledge as well as self-efficacy. Knowledge of child development mediated the relationship between maternal education and input complexity (a measure of interaction quality) but not input quantity. Alper et al. noted considerable variability in parent language input, quality of interactions, and child language ability within their low SES sample. These findings lead the authors to speculate that other methods of identifying children at risk of insufficient early language experiences may be more accurate than the frequently used SES. While acknowledging the usefulness of SES in decision making for public policy, Alper et al. argued the need for identifying modifiable factors such as parent's developmental knowledge and self-efficacy for focusing service. A weakness of this study was that it did not report child disabilities such as hearing loss therefore, the hearing status of these children is unknown.

Rowe et al. (2016) examined the relationship between parent's knowledge of infant development and children's subsequent language and preliteracy development. Participants were 6,150 Black, White, and Latino families from a range of SES backgrounds, who were taking part in the Early Childhood Longitudinal Study–Birth (ECLS-B). The ECLS-B was the first longitudinal study to gather data from birth for a sample that was nationally representative of the US population. When children were nine-months-old, mothers completed 11 survey items from the KIDI (MacPhee, 1981), and at approximately four-years-old, children were assessed using items from the PPVT (Dunn & Dunn, 1997) and the

PreLAS 2000. Maternal knowledge of infant development at nine months was positively associated with both maternal education and race/ethnicity. As expected, maternal education was positively associated with children's language and preliteracy skills at age four. Importantly, Rowe et al.'s findings also determined that the relationship between maternal education and children's language and preliteracy skills was partially mediated by mother's knowledge of infant development when controlling for demographic factors.

These findings may be further explained by the work of Leung and Suskind (2020) that determined that parent/caregiver knowledge of language and cognitive development when their infant is one week old is predictive of their interactive behaviours with their baby at nine months. The quality and quantity of parent/child interaction are closely linked child language outcomes (Anderson et al., 2021; Zauche et al., 2017).

A New Zealand based study (Gibson et al., 2020) examined knowledge of child language development held by 500 parents of children aged between zero and three-years-old. The hearing status of participants' children for this study was also unknown. Data was collected via a 30-item Likert-type scale survey adapted from Suskind et al., (2016a). Gibson reported that participants held considerable knowledge on the importance of reading to their child, and early maths talk. However, there was a lack of understanding of the effect of television viewing on child development and evidence that children's vocabulary at age three predicts later language skills and academic achievement. A statistically significant relationship was found between parent/caregiver level of education and knowledge of child language development. The same was not seen to be present for SES, as measured by total household income. However, the authors noted that those with higher levels of education and household income were overrepresented, and the sample was therefore not an accurate representation of the New Zealand population. The underrepresentation of participants with low SES, resulting in reduced variation in the sample may have affected the study's findings

relating to SES. Gibson et al.'s findings replicated those by Rowe et al. (2016) that parent/caregiver education level was positively correlated with developmental knowledge. Gibson et al. also asked participants about influences on children's speech and language development. While gaps in knowledge of child language development were evident on the 30-item survey, participants written responses demonstrated a broad understanding of how children learn language. People; two-way interaction; other aural language input; environment; relationship; spending time; and child characteristics were identified as the main influences on children's speech and language development. However, Gibson et al. noted that some participant responses were brief and lacking in detail.

Two US based studies, both including control groups, demonstrated the malleability of parent/caregiver developmental knowledge (Sowa et al., 2021; Suskind et al., 2016b). Sowa et al. (2021) established that parent's knowledge of early child language and cognitive development can be changed, at least in the short term, through educational video intervention, administered at the time of newborn hearing screening. The hearing status of infants in the study was not reported.

A randomised control trial, this time with 32 parents of DHH children under four and a half years of age, examined parent's developmental knowledge and linguistic input, pre and post behavioural intervention (Suskind, 2016b). Participants in the study were of low SES, as determined by the receiving of welfare support and highest level of education being below a master's degree. Participants in the intervention group received 10 one-hour, weekly sessions with a certified early interventionist. Intervention included feedback on the past week's Language Environment Analysis (LENA) recordings as well as goal setting for the upcoming week. At one week and three months post intervention, parent-child language samples were collected via in home video recordings and participants completed a 45 (later reduced to 34) item survey on "general language development as well as hearing impairment relating to

curriculum content" (Suskind et al., 2016b). The authors reported that a significant increase was seen for parent developmental knowledge and child language promoting behaviours, at one week and again at three months post-intervention. No change was detected on any measure for the control group. This indicates that, for many parents/caregivers in this study, when they have an understanding of child language development and the importance and power of talking with their child, their behaviour will change. As expected for a study of this short duration and small sample size, no change in language abilities was detected from the child language samples. As advocated for by the Suskind et al., longitudinal research with a larger sample size is needed to determine the long-term effects of intervention on parent knowledge and the quality and quantity of their language input, as well as the influence these may have on DHH children's language development, school readiness, and educational outcomes.

Parent and Caregiver Beliefs and Decision Making

Parents and caregivers of DHH children must acquire and process information on hearing loss; language development; intervention options; and their individual child's needs. What is more, they must balance this information with their own beliefs and aspirations for their child (DesGeorges, 2016). These decisions begin with whether to participate in newborn hearing screening and continue following diagnosis and throughout childhood (Porter et al., 2018). These may occur early on, such as deciding for or against HAs or CIs, or for or against spoken language and/or sign language. They may be ongoing, such as, whether to attend appointments, for example, audiology; OLR; SLT; AODC; and First Signs. Whether to reduce distractions and maximise signal to noise ratio by turning off the television and reducing background noise. Decisions are influenced by cultural values and beliefs as well as parent's/caregiver's knowledge of child development. However, as 90 to 95% of DHH

children are born to hearing parents, these parents may have little prior experience or knowledge of hearing loss (DesGeorges, 2016; Porter et al., 2018).

A systematic review of 47 articles identified from the literature (Porter et al., 2018) revealed that research into parent's decision making has focused primarily on the decisions for or against cochlear implants, and communication modality – spoken and/or sign language. Findings between studies were sometimes conflicting, with some studies indicating that parents/caregivers felt that they had received adequate information to support their decision making, while others indicated that they had not, or had needed to independently gain additional information. Decision making was further complicated by conflicting advice from professionals or biases toward a certain approach. Parent/caregiver SES; level of education; culture; and geographic location were demonstrated to influence the general health decisions they made for their child. However, Porter et al. noted that demographic information was collected in only half of the 47 studies. They reasoned that such detail would be needed to determine the generalisability of these findings.

Two papers, published from the LOCHI study explored the beliefs and experiences associated with parenting DHH children (Erbasi et al., 2018; Scarinci, Erbasi, et al., 2018). From Erbasi et al.'s (2018) qualitative research on *parental involvement in the care and intervention of children with hearing loss*, five themes were identified from semi-structured interviews with 17 parents of 11 children,

> (1) parents work behind the scenes; (2) parents act as 'case managers'; (3) parents always have their child's language development in mind; (4) parents' role extends to advocacy for all children with hearing loss; and (5) parents serve a few roles, but at the end of the day, they are parents

Parent responses revealed their involvement to be both diverse and complex, and reaching well beyond measures typically observable to experts, e.g., attending and contributing to

appointments. An example of this was the unseen thought and preparation that went into attending appointments, to "…achieve the optimum outcome of whatever appointment she was going to. So that means her having a good sleep the night before, having a good walk... Making sure she had something to eat...". Children's ages ranged between six and nine years, and were, therefore, beyond the critical period for language acquisition.

Participants from the Scarinci et al. (2018) study, *the parents' perspective of the early diagnostic period of their child with hearing loss: information and support*, were asked about their sources of information. They reported, "discussion with an audiologist, written information, and discussion with a medical professional". Similar findings were made by Gibson et al. (2020), who explored New Zealand parents/caregivers (child's hearing status not reported) information seeking behaviours relating to their child's speech and language development. Participants reported accessing information mainly from health and education professionals and the internet. Decker et al. (2012) suggested that while parents in their study relied predominantly on their own judgement for s relating to their DHH child, they appeared to internalise the advice and opinions of professionals.

As service differs based on severity of hearing loss in New Zealand, it may be expected that parents/caregivers of children with more severe hearing loss receive more exposure to advice from professionals than would parents of DHH children with a milder loss. Increased time with different professionals may lead to further internalising of professional's opinions, thus influencing parent's/caregivers' decision making for their child. While parents and caregivers hold the power in regard to decision making for their DHH child, they are influenced by their own cultural values and beliefs, knowledge of child development and sources of information (Decker et al., 2012; Erbasi et al., 2018; Porter et al., 2018; Scarinci, et al., 2018).

Summary and Research Questions

Age of identification and intervention for DHH children in New Zealand has greatly improved since the introduction of the UNHSEIP (Digby et al., 2021). While many DHH children now demonstrate language development within the average range, on average they continue to lag behind their hearing peers (Ching et al., 2018; Fitzgerald & Associates, 2019; Lieu et al., 2020; Yoshinaga-Itano et al., 2017). A child's early years are a time of great opportunity for language development but they are also a time of vulnerability (Shonkoff & Phillips, 2000). For DHH children, adequate access to language (spoken or sign) is reliant on timely identification and intervention, quality and quantity of linguistic input, and hearing amplification device use (spoken language only).

Mediators of language associated with paediatric hearing loss discussed in the literature show further promise of improving language outcomes for these children. These include early diagnosis and intervention, quality and quantity of parent-child interaction, and hearing amplification device use (Ching et al., 2018; Gagnon et al., 2020; Hart & Risley, 1995; Park et al., 2019; Yoshinaga-Itano et al., 1998; Zauche et al., 2017). Parents and caregivers are the most important people in a child's life. Their knowledge and beliefs about child language development contribute to not only the decisions they make for their children but have been demonstrated to mediate language outcomes (Alper et al., 2021; Porter et al., 2018). Parent's and caregivers' understanding child language development and the importance and power of providing language rich experiences, may lead to behavioural changes (Sowa et al., 2021; Suskind, et al., 2016b).

The present research aims to better understand the knowledge and beliefs about child language development held by New Zealand parents and caregivers of DHH children. In doing so, it seeks to identify (a) groups that may benefit from further support, and (b) specific areas of child language development where parent/caregiver views differ from the current

literature base. In these instances, further literature-based education on child language development and language strategies for achieving optimal language outcomes for DHH children could be provided as part of service provision. Consequently, the following research questions have been asked:

1. What knowledge and beliefs about child language development are held by parents and caregivers of DHH children in New Zealand?
2. Is there a significant relationship between parental knowledge and beliefs about child language development and parent/caregiver age, and level of educational attainment?
3. Is there a significant relationship between parent/caregiver knowledge and beliefs about child language development and their DHH child's age, and presence and type of hearing amplification?

Hypotheses

Parent/caregiver level of education has been correlated with knowledge of child development as well as child language abilities (Alper et al., 2021; Gibson et al., 2020; Rowe et al., 2016b). Research has demonstrated a positive relationship between maternal age and general child development, including language development (Falster et al., 2018; Leigh & Gong, 2010). In New Zealand service differs based on severity of hearing loss therefore, it may be expected that parents/caregivers of children with more severe hearing loss receive more exposure to advice from professionals than would parents of DHH children with a milder loss. It would also be expected for cumulative time spent with professionals to increase as children age. Time spent with professionals may lead to further exposure to literature-based information which may be internalised by parents/caregivers (Decker et al., 2012). Parents and caregivers have also reported relying on professionals for information and support (Gibson et al., 2020; Scarinci, et al., 2018). Based on the literature, the following hypotheses are proposed for the two comparative research questions:

Hypothesis for Research Question Two. Older and more educated parents and caregivers are hypothesised to hold higher knowledge of child language development, compared with parents and caregivers who are younger and less educated.

Hypothesis for Research Question Three. Knowledge of child language development will be related to parent's/caregiver's DHH child's age, and presence and type of hearing amplification.

Methods

Ethical Considerations

Ethical approval for this study was granted by the University of Canterbury Human Ethics Committee on 9th November 2021. See Appendix A. Further ethical approval for support with participant recruitment was granted from the Northern Cochlear Implant Programme and The Hearing House (collectively) on 30 November 2021, and Ministry of Education on 02 December 2021.

Māori consultation was undertaken with the Ngāi Tahu Consultation and Engagement Group (NTCEG). The NTCEG determined that this study took participants' cultural needs into account when necessary and considered the project worthwhile and interesting.

Participants

Participants in this study were parents/caregivers of DHH children aged between zero and five years old who were living in New Zealand. Family/whānau members who were not the child's direct parent but who considered themselves caregivers were also eligible to complete the survey. Multiple members of the same child's family/whānau could complete the survey individually. Inclusion criteria for participation in this study were: (a) participants must be a parent/caregiver of a DHH child (b) participants must be 18 years of age or above (c) participants and their child must be currently living in New Zealand (d) participants' DHH child must be aged between zero and five years old at the time of completing the survey.

Measure

A survey was used to gather data from participants. Surveys are most useful when utilised to explore attitudes and values, which can be examined through self-observation and report (Portney, 2020). An online survey was selected as the most appropriate methodology, as this would meet the research aims of examining participants' knowledge and beliefs. In contrast to an interview-based data collection method, a larger sample size can be

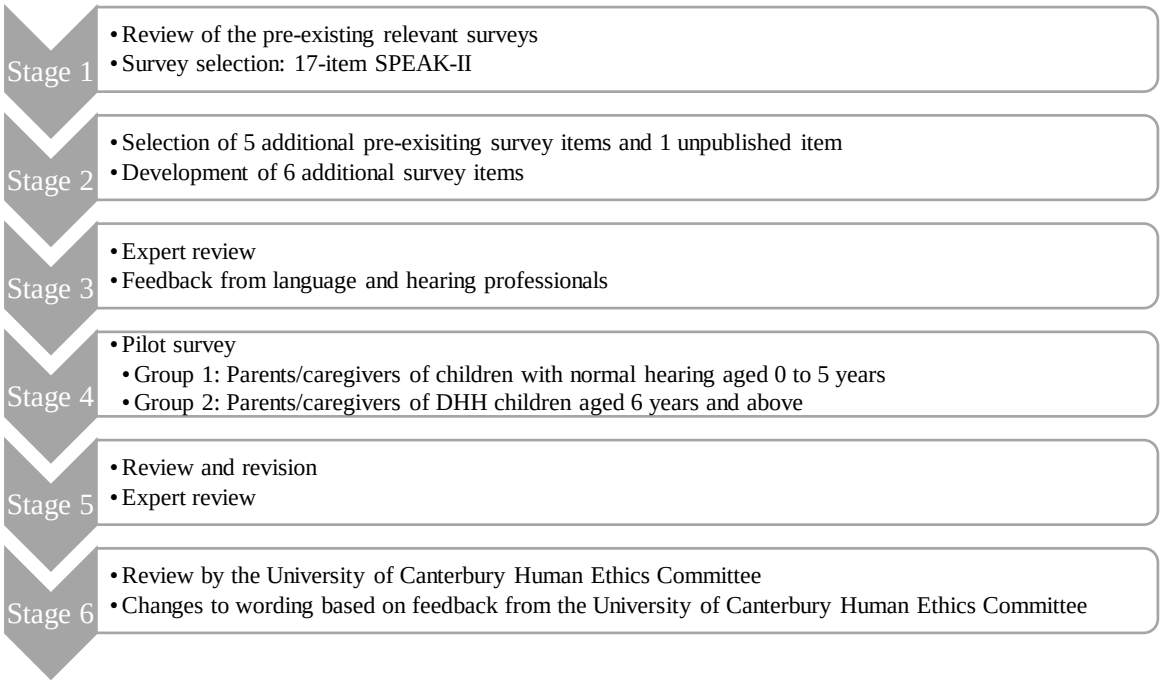
accommodated with a survey, data could be collected online nationwide, and anonymity maintained for participants.

ELD-DHH Survey Development

The 30-item survey of parent/caregiver knowledge of DHH children's language development and hearing needs, the ELD-DHH, was embedded within the online survey. An overview of the ELD-DHH survey development process is provided in Figure 2.

Figure 2

Stages of ELD-DHH Survey Development



Note. ELD-DHH = Early Language Development for the Deaf or Hard of Hearing. SPEAK = Survey of Parent/Provider Expectations and Knowledge.

A search of the relevant literature was performed to identify existing surveys on the topic of parent/caregiver knowledge of child language development and/or DHH children (Coombe, 2018; Gibson et al., 2020; Lass et al., 1985; MacPhee, 1981; Suskind et al., 2018; Suskind, Leffel, et al., 2016). From this literature, the 17-item Survey of Parent/Provider Expectations and Knowledge (SPEAK)-II (Suskind et al., 2018) was selected as the most

appropriate survey for the purposes of the current study, as it had the most specific focus on child language development when compared with similar surveys. The SPEAK-II was psychometrically validated through a three phase approach, including field testing at each phase: “phase 1: item development and refinement; phase 2: reliability testing; phase 3: validity testing” (Suskind et al., 2018). The survey is designed to assess knowledge of child language and cognitive development (birth to five years old) through 17 evidence-based items. It is criterion referenced and shown to distinguish between different degrees of knowledge held by parents/caregivers.

The SPEAK-II was designed for typically developing children and not specifically for the New Zealand DHH population. It, therefore, does not measure knowledge of hearing loss and hearing amplification that would be expected of parents/caregivers of DHH children. Neither does it address the importance of vocabulary as a predictor of later language and academic success. The SPEAK-II contains one item relating to bilingualism. Bilingualism is important within the New Zealand context, as the country has three official languages, Te Reo Māori, English, and NZSL (Parliamentary Press Office, 2006).

To address these areas important to language development in DHH children, thirteen additional items were included, taking the total number to 30. Five items were from Suskind and colleagues’ earlier study (Suskind et al., 2016a). One item, item (17) *Whānau/parents should use the language they are most familiar with to their children,* (Sivertsen, 2022) was based on the New Zealand childhood curriculum *Te Whāriki* (Ministry of Education, 2017). Six items were developed by the research team.

The survey was reviewed by the research team and by language and hearing professionals. Minor adaptations were made to fourteen items from the 17-item SPEAK-II (Suskind et al., 2018) and Suskind et al. (2016a). The SPEAK-II consisted entirely of negatively worded items, meaning that the most correct response to all items was ‘strongly

disagree'. According to Portney (2020) items in a Likert scale based survey should "reflect an equal number of both favourable and unfavourable attitudes". Items in the SPEAK-II were therefore adapted to provide a balance of positive and negative wording. These and further adaptations are displayed in table 2.

Table 2

Adaptations to Survey Items from the 17-Item SPEAK-II (Suskind et al., 2018), and Suskind et al. (2016a)

	Original questions	Adapted questions	Reason for adaptation
Suskind (2018)	When do you think a child is ready to be exposed to words?	When do you think a child is ready to be exposed to words/signs?	To acknowledge NZSL
	Infants learn little about language in the first six months of their life.	Infants learn a lot about language in the first six months of their life.	Change to positive wording
	Toddlers learn more when they are told exactly what to do instead of given choices.	Toddlers learn more when they are told exactly what to do instead of being given choices.	Grammatical correctness
	Toddlers can learn more from watching educational TV than they can from being read to by their parents.	Toddlers can learn more from being read to by their parents than they can from educational screen time.	Change to positive wording To reflect changes in technology use
	The things a young child learns before he or she goes to kindergarten matter very little in the long run.	The things a young child learns before he or she goes to school are important for later learning.	Change to positive wording To reflect the New Zealand context
	Young children should only learn one language at a time so they don't get confused.	Children with normal hearing should only learn one language at a time, so they don't get confused. Deaf or hard of hearing children should only learn one language at a time, so they don't get confused.	To better measure the knowledge and beliefs of the target sample
	Children 0 to 2 years old can learn just as many words from educational TV as they can from their parents.	Children 0 to 2-years-old can learn just as many words/signs from educational screen time as they can from their parents.	To reflect changes in technology use
	Leaving the TV on in the background is a great way to give 0 to 2 year olds extra chances to learn new words.	Leaving the TV on in the background is a great way to give 0 to 2-year-olds extra chances to learn new words/signs.	To acknowledge NZSL

	Original questions	Adapted questions	Reason for adaptation
Suskind (2016a)	Children learn fewer words when they don't pay attention to what you're saying.	Children learn fewer words/signs when they don't pay attention to what you're saying/signing.	To acknowledge NZSL
	Having conversations with adults while watching television can help 3-year-olds learn new words/signs.	Having conversations with adults during screen time can help 3-year-olds learn new words/signs.	To reflect changes in technology use To acknowledge NZSL
	Children who know fewer words when they start school will probably do worse in third grade than their classmates who know more words.	Children who know fewer words/signs when they start school will probably do worse in year four than their classmates who know more words/signs.	To acknowledge NZSL To reflect the New Zealand context
	How many words 3-year-olds know can predict how well they might do in kindergarten.	How many words/signs a 3-year-old knows can predict how well they might do in their first year of school.	To acknowledge NZSL To reflect the New Zealand context
	How many words 3-year-olds know cannot predict how many new words they will learn during their lifetime.	How many words/signs a 3-year-old knows cannot predict how many new words/signs they will learn during their lifetime.	To acknowledge NZSL

Note. SPEAK = Survey of Parent/Provider Expectations and Knowledge

NZSL = New Zealand Sign Language

The survey was piloted with two groups: group (a) Parents/caregivers of DHH children aged six years and above, and group (b) Parents/caregivers of children with normal hearing aged zero to five years. The survey was not piloted with members of the target population (parents/caregivers of DHH children aged zero to five years old) as recommended by Portney (2020) to avoid reducing the pool of potential participants willing to participate in the final survey. Instead, the two groups were selected to most closely represent the target population. Nineteen responses were received from group (a), and one response from group (b). A larger sample size was not collected for group (b) due to the time constraints of this study. These responses and feedback from respondents were used to inform further revisions. Changes made included correcting spelling and grammatical errors, using more inclusive

language, improving survey layout and flow, and improving readability by simplifying wording and reducing ambiguity. The survey was then reviewed a final time by the research team.

The Flesch Kincaid reading ease score for the finalised ELD-DHH survey was 70.6 (scored from one to 100, with higher scores indicating greater readability) with a Flesch Kincaid Grade Level of 8.4 (corresponding to a reading age of 13 to 14 years) (Flesch, 1948).

Survey Description

The survey consisted of participant and DHH child demographic questions, the ELD-DHH 30 items on child language development (including 3 multiple choice questions, and 27 five-point Likert-type scale items), and two additional open text questions. A Likert scale is a psychometric scale that asks users to rate statements based on how much they agree or disagree with each statement (Portney, 2020). A five-point Likert-type scale was utilised and consisted of the options – *strongly agree; somewhat agree; neither agree nor disagree; somewhat disagree;* and *strongly disagree*. The question design differed from a traditional Likert scale in that the options were not accompanied by a number rating of one to five. The Qualtrics online survey platform (Qualtrics, 2020) was used to develop and distribute the survey. Qualtrics was deemed to be the most appropriate survey platform due to its advanced designed features and analysis tools. The full survey is provided in appendix D.

Section 1: Participant and DHH child demographics. Demographic information was collected about participants and their DHH child. Careful consideration was given to the type of question used to elicit different types of information. For example, additional diagnoses or conditions, and the degree and type of each participant's child's hearing difficulty were collected via an open text question. An open text question was selected over a multiple-choice question to better capture the variability in parent/caregiver knowledge and to avoid 'guess' responses. Age and daily hours of hearing amplification use were measured

using a continuous scale, whereas categorical data was collected for the other demographic variables. Participants were able to add text comments to clarify the information they provided where needed. If a participant had more than one DHH child aged zero to five years, they were able to provide demographic information for each child.

Section 2: ELD-DHH survey of child language development and hearing needs. The ELD-DHH survey covered 9 themes: (*1) early exposure to learning opportunities (2) language development in infants (3) language development in toddlers (4) language development in young children (5) vocabulary as a predictor of later language outcomes and academic success (6) bilingualism (7) reading books with children (8) screen time (9) DHH children and hearing amplification.*

Section 3: Open-text questions. The final questions in the survey were two open text qualitative questions. These were included to capture participant's 'voice', to enrich the data, and to identify themes related to their beliefs about the main influences on, and barriers to DHH children learning to talk and/or sign.

Survey Distribution

The purpose of recruitment for this study was to achieve a participant sample that was representative of parents/caregivers of DHH children across New Zealand. The following groups provided support with recruitment for this project:

- Social media pages of DHH community and support groups
    - Deaf Aotearoa – First Signs
    - Deaf children New Zealand
    - Deaf Action New Zealand
    - Regional parent support groups
- District Health Board (DHB) Audiology departments across New Zealand
- Dilworth Hearing, FortèHealth

- The Ministry of Education via Advisors on Deaf children
- Ko Taku Reo – Deaf Education Centre
- Southern Cochlear Implant Programme
- Northern Cochlear Implant Programme and the Hearing House
- The researcher's personal social media pages
- The researcher's personal networks
- Snowball recruitment

Active recruitment of participants ran for two months, from 11 November 2021 to 10 January 2022. During the recruitment stage, the survey was shared several times via social media, as recommended by Portney (2020). See appendix B for study advertisements. Participants accessed the Qualtrics survey via a web link or QR code. They were required to read the study information displayed on the first page and provide informed consent before accessing the survey questions. Participants were able to retract consent by exiting the survey at any time prior to clicking 'submit survey'. Incomplete responses were not used. See appendix C for participant information and consent.

Participants were given the option of entering a draw for one of four NZD$50 gift vouchers. A random number generator on Microsoft Excel was used to select the four winners of the $50 fuel vouchers. Winners were contacted and fuel vouchers were mailed following the completion of data collection.

ELD-DHH Survey Scoring

The ELD-DHH survey was scored out of 30 points, with one point available for each item. To score the three multiple-choice questions, one point was given where participants selected 'as an infant (0 to 6 months)' or 'as a baby' (6 to 12 months). Zero points were given where participants selected any of the four other options, 'as a toddler (1 to 3 years), in early

childhood (3 to 5 years)', 'in their first year of school (5 to 6 years)', or 'later in school (6 years and up)'.

To score the 27 Likert-type scale items, each 5-point Likert-type scale was collapsed into two categories. Category (a) *response consistent with international literature*, received one point. Category (b) *response inconsistent with international literature*, received zero points. Within the survey, it differed whether 'agree' or 'disagree' was the response most consistent with international literature. Where agree was the *consistent* response, 'strongly agree' and 'somewhat agree' were collapsed into category (a) and received one point, 'neither agree nor disagree', 'somewhat disagree', and 'strongly disagree' were collapsed into category (b) and received zero points. Vice versa, where disagree was the *consistent* response, 'somewhat disagree' and 'strongly disagree' were collapsed into category (a) and received one point, 'neither agree nor disagree', 'strongly agree', and 'somewhat agree' were collapsed into category (b) and received zero points. The scoring of three items from the survey is given as an example in Table 3. For complete scoring of all 30 items on the ELD-DHH survey, see appendix E.

Table 3

Example of the Scoring of the Likert-type Scale Items from the ELD-DHH

Example survey items		Responses most consistent with international literature	
		1 point	1 point
1	When do you think a child is ready to be exposed to words/signs?	As an infant (0 to 6 months)	As a baby (6 to 12 months)
4	Babies learn a lot about language in the first 6 months of life	Strongly agree	Somewhat agree
5	Responding to a baby every time he or she cries will only end up spoiling him or her.	Strongly disagree	Somewhat disagree

Statistical Analysis

Data from the ELD-DHH survey was analysed using Jamovi computer software (The Jamovi Project, 2021) and was summarised using descriptive statistics. Data was checked for outliers as well as for skewness and kurtosis. Bivariate correlations were calculated using a Spearman's correlation coefficient, which is based on a non-parametric distribution, for parent/caregiver knowledge of child language development and continuous variables participant age and their DHH child's age. A non-parametric one-way ANOVA (Kruskal-Wallis Test) was used to analyse the relationship between parent/caregiver knowledge of child language development and categorical variables participants' highest level of education, and presence and type of hearing amplification worn by their DHH child. A pre-set alpha level (p = .05) was used, meaning a five percent possibility of a type I error.

A thematic analysis was used to analyse the qualitative open text data of this study, using qualitative data analysis software MAXQDA 2022 (VERBI Software, 2019). A post-positivist approach was taken, meaning that the researcher has attempted to view the data objectively while recognising and acknowledging the influence of their own epistemology (Ryan, 2006). This approach was taken to best represent participants' experiences and beliefs. Note, the researcher's background as a New Zealand European; speech language therapist; audiology student; and person with normal hearing. The researcher has viewed and categorised the data through a lens formed by their own, "social, cultural, historical, disciplinary, political, and ideological positionings" (Braun & Clarke, 2020).

Braun and Clarke's (2012) six phase approach to thematic analysis was used to generate codes and themes from participants' responses. Using an inductive approach, participant's language and concepts were represented using codes, which were then grouped into themes. Codes and themes were also reviewed by another member of the research team. A thematic map was created to review and revise candidate themes. Themes were reviewed

in relation to the complete set of data to ensure participants' experiences and beliefs were well represented. Themes were carefully named to capture the unique tone of the codes within. Deviating from Braun and Clarke's (2012) six phase approach, reporting of theme and code frequency is included in this study. However, a code mentioned only once is considered no less valid than another mentioned multiple times, and this is reflected in the reporting of the data. The reporting of theme and code frequency is not intended to suggest that a higher number holds more weight, but to provide transparency of the coding process. The DHH services model in New Zealand assumes that best outcomes will be achieved if parents'/caregiver's knowledge and beliefs align with the international literature on child development. Therefore, it is relevant to know which themes and codes were generated more or less frequently. In accordance with Braun and Clarke, (2012) themes and codes reflect the range of perspectives shared by participants. Their conceptualisation was not altered by frequency reporting. An example of a theme is *networks of support* and a code that sat within this theme was *whānau/family*. A quote that contributed to this code came from participant 35, "whānau support".

Results

This chapter provides an overview of the results of the study, as they relate to the research questions. It explores parent and caregiver knowledge and beliefs about child language development and looks for relationships between this dependent variable and the independent variables of participant age, education, their DHH child's age, and presence and type of hearing amplification.

Descriptive Statistics

Sixty-one responses were received in total with six participants accessing the survey via the QR code, and 55 via the anonymous link. Twenty-three responses were incomplete, and two respondents had DHH children aged over five years. These 25 responses were therefore excluded from the study. A total of 36 participants provided complete responses to the survey and met all inclusionary criteria. Their data is analysed in the results section of this study.

Participants were aged 23 to 47 years old, with a mean age of 36.1 years (SD = 5.8) and were living in Aotearoa New Zealand. In accordance with Statistics New Zealand (2018) reporting of ethnicities, participants were able to identify as more than one ethnicity, resulting in the number of recorded ethnicities exceeding 100%. Ethnicity data is as follows: New Zealand European (n=30, 83.3%), Māori (n=7, 19.4%), Pacific Peoples (n=1, 2.8%), Asian (n=2, 5.6%), and other (n=1, 2.8%). Zero participants identified as Middle Eastern, Latin American, and African (MELAA). Given the small sample size, ethnicity distribution of participants in this study was reasonably representative of the demographics that make up the population of Aotearoa New Zealand. However, Pacific Peoples and Asian families were underrepresented. Ethnicity data as reported by Statistics New Zealand (2018): New Zealand European (70.2%) Māori (16.5%); Pacific Peoples (8%); Asian (15.1%); MELAA (1.5%); and other (1.2%).

Participants were asked about their highest level of education and were grouped into four categories, in accordance with the New Zealand qualifications framework (NZQA, 2016). When compared with the New Zealand population, people with higher levels of education were overrepresented in this participant sample. Note, the participant sample age range of 23 to 47 years compared with the New Zealand population age range (25 to 64 years) reported by Education Counts (2020). Table 4 displays participants by highest qualification compared with the New Zealand population.

Table 4

Participants by Highest Qualification Compared with the New Zealand Population (Aged 25 to 64 years) (Education Counts, 2020)

	NZQF levels	Participants (23 to 47 years)		New Zealand population (25 to 64 years) (%)
		n	(%)	
No qualification	0	1	2.8%	13%
School qualification	1-3	9	25.0%	21%
Tertiary certificate or diploma	4-6	8	22.2%	28%
Bachelor's degree or higher	7-10	18	50%	35%

Note. NZQF = New Zealand qualifications framework.

The total household income for participants included the ranges of less than $17,026 (2.8%, n = 1), $17,026 to $30,006 (5.6%, n = 2), $55,525 to $94,847 (27.8, n = 10), $94,848 and above (63.9%, n = 23).

Participants were asked about their own hearing status and their relationship to their DHH child. Thirty-four participants had normal hearing (94.4%), and two were hard of hearing (5.6%). Thirty-one participants identified as mother (86.1%); three as father (8.3%); one as grandparent (2.8%); and one as stepparent (2.78%). Thirty-five parents/caregivers had one DHH child aged zero to five years, and one parent/caregiver had two DHH children within this age range (n=37).

Participants reported on demographics relating to their DHH children. Five children were aged zero to one year old (13.5%); four were one year old (10.8%); seven were two years old (18.9%); two were three years old (5.4%); ten were four years old (27.0%); and nine were five years old (24.3%), with a mean age of three years (SD = 1.67).

Based on parent/caregiver reports, 30 children had bilateral hearing loss (81.1%), and seven had unilateral hearing loss (18.9%). Five children had a mild to moderate hearing loss (13.5%), nine had moderately severe to severe hearing loss (24.3%), 13 had profound hearing loss (35.1%), and 10 children (27.0%) were either waiting on further diagnostic audiological assessment, their parents/caregivers provided a non-audiological description of their child's hearing loss, or they were unsure of the degree of hearing loss.

Congenital and childhood deafness is often associated with other conditions. Of the 37 children, 25 had no additional diagnosis (67.6%), seven had a diagnosis related to learning, intellectual, or linguistic development (18.9%), and five had a medical diagnosis unrelated to learning or language (13.5%). Examples of diagnoses relating to learning, intellectual, or linguistic development were Down Syndrome, and global developmental delay. Examples of medical diagnoses unrelated to learning or language were eczema, and heart issues.

Interventions for hearing loss received by these children included: hearing aids (48.65%, n = 18); cochlear implants (29.73%, n = 11); unilateral cochlear implant and a hearing aid worn on the better ear (5.41%, n = 2); no hearing amplification (13.51%, n = 5); and both cochlear implants and no hearing amplification selected by participant (2.7%, n = 1). For analysis purposes, participants were categorised into three groups: cochlear implants (participants whose child had received unilateral or bilateral cochlear implants), hearing aids (participants whose child wore unilateral or bilateral hearing aids and had not received an implant), and no device (participants whose child did not wear a hearing amplification

device). Excluding children who did not use hearing amplification, participants reported that their children wore their hearing aids and/or cochlear implant processors between zero and 13 hours per day, with an average wear time of 10 hours (SD = 2.9).

Participants reported that their children were exposed to the following languages: English (91.9%, n = 34), NZSL (71.3, n = 26), and Te Reo Māori (21.6%, n = 8). Participants were asked about, but not did not report speaking any other languages. Seven children received monolingual language exposure (18.9%), 19 bilingual (51%), and 11 trilingual language exposure (29.7%).

Children received support from the following New Zealand based organisations and specialists: audiology (97.0%, n = 35); AODCs (77.0%, n = 28); child development services (5.6%, n = 2); early intervention team (2.8%, n = 1); First Signs (66.7%, n = 24); NZSL tutors (19.4%, n = 7); speech language therapy (SLT) (30.6, n = 11); occupational therapy (OT) (19.4%, n = 7); physiotherapy (PT) (8.3%, n = 3); Ko Taku Reo – Deaf Education Centre (22%, n = 8); Resource Teachers of the Deaf (RTD) (2.8%, n = 1); Southern Cochlear Implant Programme (SCIP) (11.1%, n = 4); and The Hearing House (13.9%, n = 5). The number and types of service accessed are likely underreported. For example, fourteen participants reported that their children had cochlear implants but only nine reported receiving support from either The Hearing House or SCIP. Services received by the parents/caregivers who had two DHH children were reported on collectively and therefore counted in the same way, as a single response.

Of the 36 analysed responses, 35 participants completed the survey in its entirety. Survey items relating to DHH children and hearing amplification were optional for participants whose children were learning NZSL and not spoken language. One participant (participant 21) elected to skip this optional section and their response was, therefore, scored out of a total of 25 items, and is analysed separately.

Participant Knowledge and Beliefs About Child Language Development

Research question one asks, what knowledge and beliefs about child language development are held by parents/caregivers of DHH children in New Zealand? This question is addressed through participant responses to the two open text survey questions and the ELD-DHH survey relating to child language development. A thematic analysis was performed on the open text questions. All 36 participants provided responses to both questions, and the data is presented within themes that relate to research question one.

Beliefs About the Main Influences on DHH Children Learning Language

Five themes were identified from participant responses to the question, what do you think are the main influences on DHH children learning to talk/sign? These themes and the number of times each was mentioned are displayed in table 5. Participant quotes illustrating each theme are also provided.

Table 5

Themes Relating to Parent's / Caregiver's Beliefs About the Main Influences on DHH Children Learning Language.

Themes		Times mentioned	Quotes illustrating the theme
	Codes		
Theme 1: Access to language		39	"Constantly talking to children giving them opportunities to learn both spoken language and sign." (Participant 31); "We learnt sign with our son when he was 1-2 and he was able to communicate with us using those signs …" (Participant 8); "being spoken to all the time and introducing new vocabulary" (Participant 22); "exposure (needing more exposure than hearing peers given less incidental listening)" (Participant 24)
	Linguistic input	11	
	Exposure to NZSL	11	
	Exposure to spoken language	5	
	Talking	4	
	Early Intervention	5	
	Books and reading	4	
	Codes		
Theme 2: Networks of support		35	"Parents and teachers" (Participant 20); "the people they are exposed to …" (Participant 7); "Involve … all the people in their lives" (Participant 9); "whānau support" (Participant 35); "Supporting them and treating them like other children not segregating them or focusing on their difference (Participant 31).
	Parents/caregivers	11	
	People	9	
	Whānau/family	6	
	Education providers	3	
	Inclusion	3	
	Other children	2	
	Educating others	1	

Themes		Times mentioned	Quotes illustrating the theme
	Codes		
Theme 3: Language infused interaction		15	"Quality one-on-one interactions …" (Participant 11), "Repetition of common words & phrases … recognition for their efforts & offering corrections when necessary" (Participant 10), "… having one on one time with a caring adult …" (Participant 14)
	One on one interaction	5	
	Repetition	4	
	Taking time	2	
	Doing our best	2	
	Praise and correction	1	
	Fostering trust	1	
	Codes		
Theme 4: Hearing		8	"Hearing loss" (Participant 2); "struggle with background noise …" (Participant 3); "… wearing hearing devices early on" (Participant 17); "it's important the child's hearing is maximized with tools like hearing aids and CIs" (Participant 1)
	Hearing loss	1	
	Hearing amplification devices	4	
	Background noise	2	
	Environment	1	
	Codes		
Theme 5: Other		9	"child's choice" (Participant 15); "… loving and nurturing home environment" (Participant 33); "… lockdown …" (Participant 5); "not sure" (Participant 28)
	Child's interests	3	
	Access to service	2	
	Home environment	1	
	Hearing parents	1	
	Lockdown	1	
	Not sure	1	

Note. NZSL = New Zealand Sign Language.

Additional quotes are provided for the purpose of summarising themes *access to language* and *networks of support*. Further quotes are provided for themes *hearing* and *other* to highlight where a participant has reported something of particular interest.

Access to language was identified as the predominant theme throughout participant responses and was coded 39 times. This is highlighted through the following response from participant 1, "Exposure to fluent/proficient language regardless of what language. If only going the spoken language route, then it's important the child's hearing is maximised with tools like hearing aids and CIs otherwise it's important to expose them to fluent signing. Books and reading".

Networks of support was identified 36 times. This theme is summarised well by participant 30, "their parents and people they spend most time with, immediate family and

caregivers". Interestingly, participant 31 noted their role in *educating others* within their *network of support*, "educating those around you e.g., family, siblings, making it a normal part of family life".

Language infused interaction was the second most often mentioned theme, mentioned 15 times. Participants gave brief responses and used similar language to one another. Their language is strongly reflected within the codes of this theme.

The theme of *Hearing* was mentioned eight times. Coded under *hearing amplification devices* (4) and of note, participant 5 reported, "The implant falls off a lot. And I mean hundreds of times a day".

Nine codes did not fit within an existing theme, nor did they relate significantly to each other. These were grouped as *other* and include the code *access to services* (2). Of significance, participant 24 emphasised the importance of *access to services*, "being able to access consistent therapy to learn. My family have had access to private speech and language tuition since my daughter was 1.5 years old, as well as public therapy. This has been critical".

Participant Perceptions of the Barriers to DHH Children Learning Language

Six themes were identified from participant responses to the question, what barriers have you faced in supporting your DHH child learning to talk/sign? These themes and the number of times each was mentioned are displayed in table 6.

Table 6

Themes Relating to Parents' and Caregiver's Perceptions of the Barriers to DHH Children Learning Language

Themes			Times mentioned	Quotes illustrating the theme
	Codes	Subcodes		
Theme 1: Barriers to accessing services and support			24	"Not having a permanent audiologist in our region for nearly 2 years" (Participant 32); "Getting the right support in a timely manner" (Participant 28); "we have only had 2 sign language lessons in the last year due to sickness and lockdowns, so it's been very difficult to teach our child any sign language" (Participant 28); Covid- not being able to have visits from our first signs tutor" (Participant 32); "Funds to fund private speech therapy" (Participant 7)
	We did not have access to the right services at the right time		7	
	Covid-19		6	
		Access to NZSL	3	
		Exposure to other voices	1	
	Late diagnosis		2	
	Time away from work for appointments		2	
	Financial cost		2	
	Not knowing anyone in the Deaf community		1	
	Codes	Subcodes		
Theme 2: Barriers to learning NZSL			18	"Us as parents having to learn NZSL and being comfortable to be able to use it consistently" (Participant 32), "learning and mastering the sign right myself" (Participant 20), "to get everyone on board and using the same signs/language" (Participant 14)
	Learning NZSL as an adult		11	
		Teaching NZSL to my child	3	
		Not knowing anyone else who signs	1	
	Not having everyone onboard		3	
	Codes	Subcodes		
Theme 3: Facilitators of DHH children's language development			10	"[service provider] and [service provider] have been great" (Participant 5), "the support is amazing" (Participant 27), "we up skilled ourselves to learn NZSL and get involved with ideas from local Deaf Children's Association & do anything to make sure our children would be getting a great head start to their language development and education" (Participant 34)
	When services worked well to support their child's language development		7	
	Parents'/caregiver's dedication		3	

Themes			Times mentioned	Quotes illustrating the theme
	Codes	Subcodes		
Theme 4: No Barriers			7	"N/a" (Participant 23), "none" (Participant 4, 22, & 27),
	Codes	Subcodes		
Theme 5: Difficulties with hearing amplification			4	"We have struggled with talking as she likes to pull out her hearing aids and can therefore not hear what's being said" (Participant 26), "looking after hearing aid" (Participant 17)
	Keeping hearing aids on young children		2	
	Looking after hearing aids		1	
	Noisy environments		1	
	Codes	Subcodes		
Theme 6: Other			10	"time" (Participant 2, 19, & 33), "We have just recently started this journey so difficult to say while our child is still so young" (Participant 13), "Having older children around" (Participant 11)
	Time		5	
	Additional diagnoses or conditions		1	
	We are new to this journey		1	
	Not all parents have the skills		1	
	Normal life		1	
	Having older children		1	

Note. DHH = Deaf or hard of hearing. NZSL = New Zealand Sign Language.

Additional quotes are provided for themes *barriers to accessing service, facilitators of DHH children's language development,* and *other,* with the intention of highlighting where a participant has reported something of particular interest.

Barriers to accessing services and support was the most frequently mentioned theme throughout participant responses and was coded 24 times. Within this theme were the codes *time away for appointments, and late diagnosis.* Related to *time away for appointments* participant 16 shared, "… the only issue we had was travelling to appointments with it being a 5 hour each way road trip. This was hard being away from home and work for the first 2 years …". Participant 31 shared the impact of their child's late diagnosis,

> Spending 13 months waiting for a diagnosis … not having the support prior to her diagnosis … I feel if my daughter at least had access to things like [service provider] … I might [have been] able to better support her journey of learning to talk and sign … but she didn't hear speech sounds until she was 13 months old.

Barriers to learning NZSL featured 15 times. L*earning NZSL as an adult* was the most frequently mentioned code within this theme, at 11 times. Participant 8 reported, “I didn't know how to sign myself. And I felt inadequate when learning”. Participants found it challenging *teaching NZSL to their child* while still learning themselves, mentioning this three times.

Participants were asked about barriers to their child’s language development however, 10 responded with *facilitators of DHH children’s language development.* Within this theme *how and when services worked well to support their child’s language development* was coded seven times. Participant 16’s response discusses support from their auditory verbal therapist (AVT) and other service providers,

> We had excellent AVT support at the beginning of our journey… we used skype and our AVT therapist was next level incredible at her job … appointments were all coordinated so we would travel for audiology, doctor appointments, and always fit an AVT session into these visits

Parents’/caregiver’s dedication was coded three times, and an example came from participant 4, “I haven’t returned to work after a year as I think she needs more support in these early years”.

No barriers, captures the voices of seven participants who reported that they had not faced any barriers in supporting their DHH child to learn to talk/sign. This was reported in a brief and direct way in all responses, for example, “nil” (Participant 3) and “I can’t really think of any” (participant 34).

Difficulties with hearing amplification was mentioned infrequently (4) nonetheless, has been included due to its high relevance to the sample population.

Codes that did not fit within an existing theme, nor relate significantly to each other were grouped as *other (10).* The most notable of these was *time* (5). Participant 10 detailed

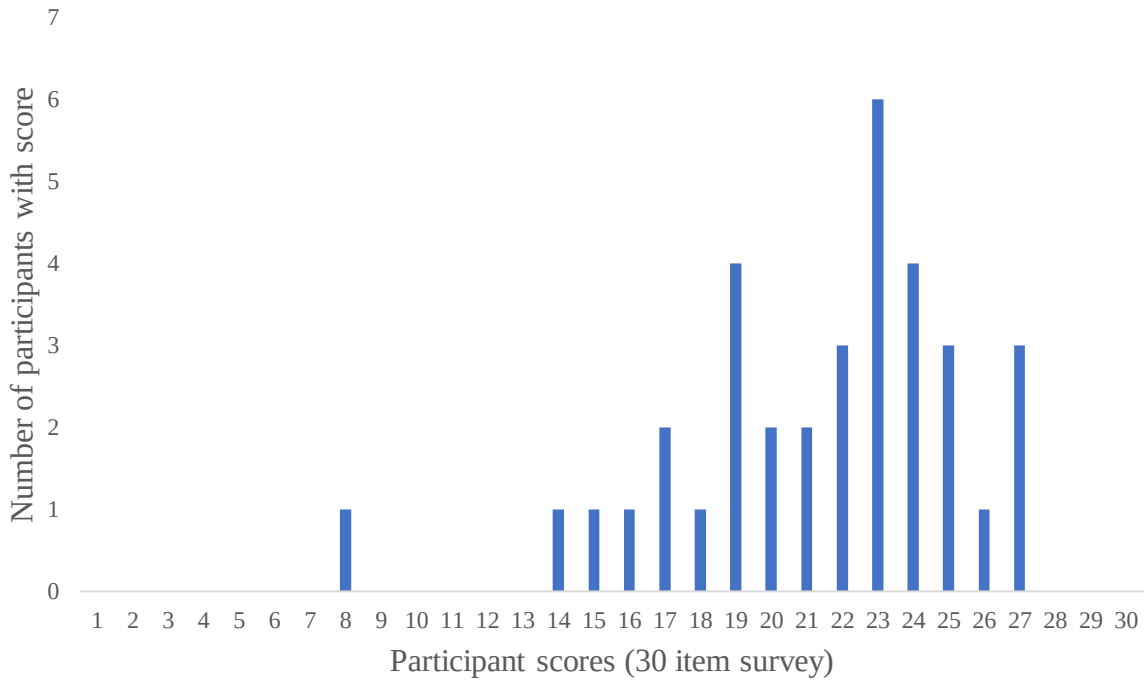
supporting their DHH child who had an *additional diagnosis*, “my child has global development delay which impacts on his ability to communicate well despite his hearing loss. I don't know how to determine between speech delay because of hearing difficulties or because of development delay”.

Participant Knowledge of Child Language Development on the ELD-DHH Survey

Across all participants to complete all 30 items on the ELD-DHH survey the mean score was 21.3 (SD = 4.1). Individual scores ranged from 8 to 27. A high level of kurtosis (1.77) and negative skewness (-1.08) meant that data was non-normally distributed. Therefore, non-parametric statistical analyses have been used to analyse the data. Counted separately, participant 21 scored 21 out of 25 survey items. The distribution of participant scores on the ELD-DHH survey are displayed in figure 3.

Figure 3

Distribution of Participant Scores on the ELD-DHH Survey



Note. ELD-DHH = Early Language Development for the Deaf or Hard of Hearing

Of the nine themes, the highest score was seen for *early exposure to learning opportunities* with a mean of 2.9 out of 3 (SD = 0.3), demonstrating a high level of consistency with the international literature (Suskind et al., 2018; Suskind, 2016a). *Vocabulary as a predictor of later language and academic success* had the lowest mean score (1.8 out of 4, SD = 1.3). Interestingly, participants' responses showed equal consistency with the literature on *language development in young children*; *reading books with children*; *screen time,* and *DHH children and hearing amplification devices,* as demonstrated by their percentage scores of 70%. See table 7 for complete results.

Table 7

Means and Standard Deviations for the Nine ELD-DHH Survey Themes

Theme	*n*	Max possible score	M	SD	Percentage score
Early exposure to learning opportunities	36	3	2.9	0.3	96.7%
Language development in infants	36	3	2.4	0.8	80.0%
Language development in toddlers	36	3	2.5	0.8	83.3%
Language development in young children	36	3	2.1	0.6	70.0%
Vocabulary as a predictor of later language and academic success	36	4	1.8	1.2	45.0%
Bilingualism	36	3	2.2	0.9	73.3%
Reading books with children	36	3	2.1	1.0	70.0%
Screen time	36	3	2.1	0.9	70.0%
DHH children and hearing amplification devices	35	5	3.5	1.2	70.0%

Note. DHH = Deaf or hard of hearing.

The individual survey item where participant responses showed the least consistency with international literature was, "children learn fewer words/signs when they don't pay attention to what you're saying/signing" (36.1%). Other items to show low consistency came predominantly from the theme *Vocabulary as a predictor of later language and academic*

success. Table 8 displays the survey items with scores below 55%, indicating that participant's responses showed the lowest consistency with international literature for these items. Please see appendix E for complete survey results.

Table 8

ELD DHH Survey Items with Low Group Scores

Themes	Item no.	Survey Item	*n*	Correct response according to international literature	Percentage score
Language development in young children	11	Children learn fewer words/signs when they don't pay attention to what you're saying/signing.	36	Agree	36.1%
Vocabulary as a predictor of later language and academic success	14	How many words/signs a 3-year-old knows can predict how well they might do in their first year of school.	36	Agree	47.2%
	15	How many words/signs a 3-year-old knows cannot predict how many new words/signs they will learn during their lifetime.	36	Disagree	25.0%
	16	Children who know fewer words/signs when they start school will probably do worse in year four than their classmates who know more words/signs.	36	Agree	38.9%
Bilingualism	17	Whānau/parents should use the language they are most familiar with to their children.	36	Agree	52.8%
DHH children and hearing amplification devices	26	It is best for children to have regular breaks from listening with their hearing aids or cochlear implants throughout the day.	35	Disagree	37.1%

Note. DHH = Deaf or hard of hearing.

Participant Age and Education as Predictors ELD-DHH Survey Scores

Research question two asks, is there a significant relationship between parental knowledge and beliefs about child language development and parent/caregiver age, and level of educational attainment?

Participant age

A statistically significant moderate positive relationship was found between participant age and survey scores as determined by a Spearman's correlation coefficient, which is based on a non-parametric distribution *($r = 0.398$, $p = .018$).* This indicates that older parents/caregivers demonstrated higher knowledge of child language development on this measure.

Participant Education

There was a statically significant difference between education groups for survey scores as determined by a non-parametric one-way ANOVA (Kruskal-Wallis Test) ($\chi^2(3) = 9.29$, $p = .026$). This indicates that participants with higher levels of education had higher scores on knowledge of child language development. For the three lower scoring groups, post high school, high school, and no formal qualification, an inverse correlation was seen. However, note only one participant reported they had no formal qualification, which may have skewed the data. The higher standard deviation in the school qualification (NZQF levels 1 to 3) group (5.3) indicates that there was a trend for more variability in knowledge scores at this level of education. Mean survey scores reported by participant level of education are displayed in table 9.

Table 9

Means and Standard Deviations on the ELD-DHH Survey by Parent/Caregiver Highest Education Level

	Education groups	*n*	M	SD
Survey Scores	No qualification	1	22.0	N/A
	School qualification	9	19.8	5.3
	Tertiary certificate or diploma	8	18.8	3.3
	Bachelor's degree or higher	17	23.2	3.0

DHH Child Related Factors as Predictors of ELD-DHH Survey Scores

Research question three asks, is there a significant relationship between parental/caregiver knowledge and beliefs about child language development and their DHH child's age, and presence and type of hearing amplification?

DHH Child's Age. No statically significant relationship was found between participants' DHH child's age, and their survey score as determined by a Spearman's correlation coefficient, which is based on a non-parametric distribution (r = .01 p = .444). This indicates that there was no apparent relationship between DHH child age and their parent's/caregiver's knowledge of child language development.

Presence and Type of Hearing Amplification. There was no statistically significant difference between the three presence and type of hearing amplification groups for survey scores as determined by a non-parametric one-way ANOVA (Kruskal-Wallis Test) ($\chi^2(2)$ = 1.95, p = *.378).* This suggests that presence and type of hearing amplification worn by participants' children was not associated with participants' knowledge of child language development. Mean survey scores reported by presence and type of hearing amplification are displayed in table 10.

Table 10

Means and Standard Deviations on the ELD-DHH Survey by Presence and Type of Hearing Amplification

	Presence and type of hearing amplification	*n*	M	SD
Survey Scores	Cochlear Implants	13	22.4	3.82
	Hearing Aids	18	20.8	4.42
	No Device	4	19.8	3.77

Discussion

This study explored the knowledge and beliefs about child language development held by parents and caregivers of DHH children. It sought to identify (a) groups that may benefit from further support, and (b) specific areas of child language development where parent/caregiver views differ from the current literature base. DHH children are an at-risk population for delays in language development due to reduced access to language (spoken or sign) during a critical period of language development (Mayberry et al., 2002). An increased understanding of the knowledge and beliefs about child language development held by parents and caregivers of DHH children may provide valuable direction for future service provision and contribute to better language outcomes for DHH children.

Participants were 36 parents and caregivers of DHH children aged between zero and five years old, who were living in Aotearoa New Zealand. Data for this study was collected nationwide via an online survey. Participants responded to demographic questions, followed by the ELD-DHH a 30-item survey on child language development and hearing needs, indicating how much they ‘agreed’ or ‘disagreed’ with each on a five-point Likert-type scale. Responses were collapsed into two categories (a) response consistent with international literature (b) response inconsistent with international literature. Two additional open-text questions captured participant’s beliefs about the main influences on, and barriers to, DHH children learning to talk and/or sign. These were analysed via thematic analysis.

On average participants’ responses were reasonably consistent with international literature, as measured by the ELD-DHH (mean = 21.3 out of 30). However, responses varied considerably within the group (range = 8 to 27). Participant responses aligned closely with the literature for the themes, *language development in infants, language development in toddlers*, and *early exposure to learning opportunities*. In contrast, responses demonstrated low consistency with the literature base for the importance of *vocabulary as a predictor of*

later language development and academic outcomes. Participants' age and highest reported level of education were correlated with higher scores on the ELD-DHH. No correlation was found between DHH child related factors: age and presence or type of hearing amplification and ELD-DHH survey scores. Thematic analysis of the open text questions indicated that participants believed the main influences on DHH children's language development were; *access to language; networks of support; language infused interaction;* and *hearing*. Whereas barriers to language development were perceived as; *barriers to accessing services* and *support, barriers to learning NZSL,* and *difficulties with hearing amplification*. Within this question participants also responded with, *facilitators of DHH children's language development*, and others reported experiencing *no barriers*.

Knowledge of Child Language Development on the ELD-DHH Survey

While participant responses to statements about child language development were reasonably consistent with international literature (mean = 21.3 out of 30), the considerable variability in scores (range = 8 to 27) indicated that some participants new substantially more than others. Roughly one third of the group scored below 52%. This is concerning, as developmental knowledge has been associated with children's receptive and expressive language abilities and quality and quantity of parent-child interaction (Alper et al., 2021; Rowe et al., 2016). Furthermore, knowledge of child language development has been linked with parenting behaviours such as responsiveness to infants' communicative cues and the provision of cognitive stimulation (Leung & Suskind, 2020). Parent and caregiver knowledge of language and cognitive development has been demonstrated to mediate the relationship between socioeconomic deprivation and language development (Alper et al., 2021). Maternal developmental knowledge has also demonstrated a mediating effect on the relationship between mother's level of education and their children's language and preliteracy skills when controlling for demographic factors (Rowe et al., 2016). Importantly, parent/caregiver

knowledge of child development, as well as parenting behaviours, are modifiable through targeted intervention. This has been demonstrated for both caregivers of children with normal hearing and those of DHH children (Sowa et al., 2021; Suskind, 2016b). These studies established the important finding that parenting behavioural change can be instigated through the provision of education on child language development and the importance of their own linguistic input.

Scores on the ELD-DHH survey varied considerably between both themes and individual items. Participants demonstrated excellent knowledge of children's learning needs in their first year of life, with an average of 97.1% agreeing that babies were ready to be exposed to language, books, and early maths concepts (shape and size) during this time. However, many were unaware of the profound impact of linguistic input in the home environment on children's language acquisition. In response to the true statement, *'the amount that whānau talk/sign with their child in their first 3 years of life can predict the number of words/signs they will know at age 3',* 66.7% of participants agreed. Birth to three years is a critical period for language acquisition. The quality and quantity of language input children receive during this time is predictive of children's language abilities, particularly vocabulary, at age three and again at age nine years (Hart & Risley, 1995). Early language nutrition is both essential for, and predictive of, later language and cognitive development, as well as academic performance (Anderson et al., 2021; Hart & Risley, 1995; Zauche et al., 2017).

A Comparison with New Zealand Parents/Caregivers of Children with Normal Hearing

An understanding of child language development is important for all parents and caregivers. However, as DHH children are at greater risk of delays in language development, it is especially important for this population. Five survey items, from the present study (those adapted from Suskind et al. (2016a) also appeared in the survey used by Gibson et al. (2020).

The wording of these items differed marginally from Gibson et al., with the addition of the word, '*signs*' in all five items. All other wording was identical between the two studies. The wording from the present study is used to discuss these items. Participants scored higher than those from Gibson et al. on all except one item. Comparisons are drawn between each of the five shared items.

Across both studies, participants' responses demonstrated low consistency with international literature for the theme '*vocabulary as a predictor of later language and academic success'*. Firstly, for the true statement*, 'how many words/signs a 3-year-old knows can predict how well they might do in their first year of school',* 47.2% agreed, compared with 36.8% from the Gibson et al. study. Secondly, for the true statement about the predictive powers of vocabulary, *'children who know fewer words/signs when they start school will probably do worse in year four than their classmates who know more words/signs',* 38.9% correctly agreed, compared with 30.2% from the Gibson et al. study. Thirdly, for the false statement, *'how many words/signs 3-year-olds know cannot predict how many new words/signs they will learn during their lifetime'* participants responses demonstrated especially low consistency with international literature. However, this time fewer from the present study correctly disagreed (25.0%), compared with Gibson et al. (29.8%).

The evidence behind these statements is strong. Children's vocabulary at three years of age is the strongest predictor of literacy, specifically reading ability, at nine years of age (Hart & Risley, 1995). Studies in the US demonstrate that when children have not achieved age appropriate reading skills by nine years old, they fall increasingly behind academically (Zauche et al., 2017). Further studies have mirrored the findings by Hart and Risley. Marchman and Fernald, (2008) demonstrated that children's vocabulary size at 25 months old was predictive of language and cognitive skills at eight years of age. Duff et al., (2015)

found similar results, that parent report of vocabulary in toddlerhood is associated with later vocabulary and literacy skills at ages ranging between four and nine years.

It is possible that participants in the present study may hold beliefs that differ from the literature. These may be based on personal observations of vocabulary growth in their own, or other's children. The commonly shared advice of, "don't worry, he/she will catch up", may have also influenced participant's beliefs. However, the reality is that many children do not "catch up", and those who appear to, often experience difficulties in other less salient areas of linguistic processing. In a summary of the literature on 'late talkers', Hawa and Spanoudis (2014) described that 70 to 80% of children who are 'late talkers' at age two, will go on to develop language within the typical range. Despite achieving age-appropriate language development and appearing to have "caught up", this group achieve below their same age peers throughout primary school years and well into adolescence, in areas of vocabulary; grammar; verbal memory; literacy; social skills; behaviour; and executive function. Participants may have also had a different interpretation of the word 'predict' than its intended meaning. Nevertheless, *vocabulary as a predictor of later language and academic success* appears to be an area where parents and caregivers could benefit from further education. This is particularly important for parents and caregivers of DHH children as they are at greater risk of language delay due to reduced access to audible language input (Digby et al., 2004).

The fourth item shared with Gibson et al. probed participants' knowledge about language learning through overhearing. For the true statement '*children learn fewer words/signs when they don't pay attention to what you're saying/signing'*, 36.1% agreed, compared with 18.8% from the Gibson et al study. Child directed speech at age two and half years is predictive of later vocabulary at age three and a half years, whereas overheard speech has not been demonstrated to add to language learning outside of laboratory settings (Fitch et

al., 2020; Shneidman et al., 2013). Language is learnt through shared reciprocal interaction and is not benefitted by passive exposure to overheard speech (Zauche et al., 2017).

Participant responses from both studies indicate that they may overestimate the influence of overhearing on linguistic growth. Scores suggest that parents and caregivers of DHH children may be more aware of the linguistic benefits of joint attention and child directed speech, but it remains an area of low knowledge. Gibson et al. reported that during the trial stage of their survey, participants reported that they needed to, 'think harder' to understand this statement. Overly complex wording could impact the result if this statement was not well understood. However, the same was not reported by participants of the pilot survey for the present study, and the Flesch Kincaid reading ease and grade level for this item were comparable with the entire ELD-DHH survey. The low alignment with the literature for this item suggests that participants in the study could benefit from education on the importance of child direct speech and joint attention for language learning.

The benefits of reading with babies and young children, and warnings to limit screen time have been frequently published in mainstream media of late (Boyask et al., 2021; Kenny, 2020; Keogh, 2019; Morton, 2021). Perhaps, as a result, participants' responses demonstrated higher consistency with international literature (70%) compared with *vocabulary as a predictor of later language and academic success* (45%). For the final survey item shared with Gibson el al., the present study's participant responses held the lowest consistency with international literature compared with other items within the theme *screen time*. For the true statement, *'having conversations with adults during screen time can help 3-year-olds learn new words/signs',* 63.9% agreed, compared with 54.4% for Gibson et al.'s study. Lavigne et al., (2015) examined parent language input during co-viewing television with one-year-old babies in comparison with no television free play. During co-viewing parent language was seen to decrease in quantity but increase in quality in

comparison with no television free play. Earlier research also suggested that television viewing could be comparable to book reading when treated as a shared interactive activity with high quality linguistic input from parents (Lemish & Rice, 1986). However, there is no evidence to suggest that educational screen time without reciprocal interaction with a present adult is beneficial for infants or toddlers. The opposite is the case, that due to decreased opportunities for linguistic interaction between parent and child, screen time may be harmful to language development (Zauche et al., 2017). As in Gibson et al. participants from the present study were unclear about the benefits and risks of screen time for young children.

Participants from the present study and the Gibson et al. (2020) study differed by geographical region, hearing status, and age of their child. The present study recruited participants nationwide, whereas respondents to Gibson et al.'s survey were predominantly from the Canterbury region of New Zealand. Gibson et al. sampled knowledge of child language development held by parents and caregivers of children from the general population (hearing status unknown) aged between zero and three years. Whereas the present study was with parents and caregivers of DHH children age between zero and five years. Gibson et al. also included a substantially larger sample size, 500 compared with 36 in the present study. From comparisons of the five items shared by Gibson et al. and the present study, it could be interpreted that parents of DHH children held greater knowledge of child language development across these items. Two explanations for this are provided. Firstly, these parents and caregivers may have accessed more services such as Audiology, ORL, AODC, and possibly First Signs, and SLT, compared with parents/caregivers of children with normal hearing. Information and support provided by these services may have led to increased knowledge of child language development. Secondly, the presence of hearing loss and related additional needs of their child may have led parents and caregivers to strive for the knowledge needed to best support their child. Research findings have demonstrated that some

parents of DHH child “always have their child’s language development in mind” (Erbasi et al., 2018). This statement cannot be confirmed as true for all parents of DHH children, and a fair comparison has not been made between this population and parents/caregivers of children with normal hearing. Results of the two studies should be compared and interpreted with caution, largely due to the considerable difference in sample size, but also the differences in participants’ geographical regions, children’s ages, and the differences in the wording of survey items (e.g., presence of the word ‘*signs’*).

Hearing Amplification Device Use

Participants reported a high average device use at an average of 10 hours per day, for their children. Conversely, the majority (63.9%) agreed with the incorrect statement, ‘*it is best for children to have regular breaks from listening with their hearing aids or cochlear implants throughout the day’*. This indicated that participants were not aware that it is best practice for children to wear their hearing devices ‘all waking hours’. Recent studies have found device use to be predictive of receptive language development (Gagnon et al., 2020) and receptive and expressive language (Park et al., 2019). Parents have been found to overestimate device use (Walker et al., 2013). In the present study, reported hours were high compared with average daily hours, based on data-logging, reported in the literature, 4.36 hours for infants and 7.57 hours for pre-schoolers (Walker et al., 2015). The present study did not have access to data logging, and device wear time is based on parent/caregiver report and should therefore be interpreted with caution.

Responses to this survey item may also reflect a balance between Erbasi et al.'s (2018) findings that ‘parents act as ‘case managers’’, and ‘parents serve a few roles, but at the end of the day, they are parents’. Keeping children wearing their HAs/CI processors takes considerable effort and ongoing monitoring on the part of parents, as demonstrated by participant 5, “the implant falls off a lot. And I mean hundreds of times a day”. Knowledge of

the importance of achieving high device use may mediate parents' and caregivers' efforts to keep their child consistently wearing their HAs/CI processors. It may be beneficial for clinicians to further emphasise the aim of 'all waking hours' to prevent auditory deprivation and achieve optimal language development when working with parents and caregivers.

Two survey items, also specific to hearing loss, may have been more difficult for participants to understand than other survey items, due to sentence length and complex wording. The first of these was, '*without hearing aids, children with mild hearing difficulties and children with severe hearing difficulties are likely to do equally well in school'.* The Flesch Kincaid reading ease score for this item was 38.4 (scored from one to 100, with higher scores indicating greater readability). The second item was, *'when wearing hearing aids/cochlear implants, Deaf or hard of hearing children hear equally well in noisy versus quiet environments'*. The Flesch Kincaid reading ease score for this item was 36.2. Despite an increase in the complexity of both items, participants scored below the average of 71.2% on the first item (65%) and well above average on the second (88.6%). This may indicate that results were reflective of participants' knowledge rather than of item complexity. The score of 65% on the false statement, '*without hearing aids, children with mild hearing difficulties and children with severe hearing difficulties are likely to do equally well in school'*, indicates that many participants may not have been aware of the relationship between hearing loss severity and academic achievement (Digby et al., 2004; Krug et al., 2016; Schrijver, 2004).

The high score of 88.6% for the false statement, *'when wearing hearing aids/cochlear implants, Deaf or hard of hearing children hear equally well in noisy versus quiet environments'*, may demonstrate participants' understanding of signal to noise ratio and/or learning from lived experiences. Lived experiences could be spending time with their child in different environments and observing increased hearing difficulties in noisy environments. Their knowledge could also be based on personal experiences of listening in background

noise. Plomp (1986) discovered that hearing aid wearers' speech perception decreased in the presence of background noise, particularly noise more than 50 to 60 dBA (A-weighted decibels). Ongoing research demonstrates that speech recognition declines with hearing loss. Furthermore, DHH children have poorer speech recognition in a range of background noise situations, compared with children with normal hearing (Goldsworthy & Markle, 2019).

Cultural Considerations

Language choices can be based on best practice of proving a strong linguistic model as well as language as part of cultural identity. Parents and caregivers are recommended to use their *home language* (their first or most fluent language) with their child (Ministry of Education, 2017; Zauche et al., 2017). This recommendation is made firstly, to provide a strong linguistic model, and secondly to preserve cultural identity associated with language. In Deaf culture, sign language is the predominant form of communication. The use of NZSL is often encouraged alongside spoken language for children with CIs or HAs. However, as 90 to 95% of DHH children are born to hearing parents (DesGeorges, 2016; Porter et al., 2018), NZSL is most often not the *home language*. Some DHH children may be unable to access adequate speech signal to learn spoken language. If parents/caregivers were to model only their *home language* (spoken language) this may be inaccessible to their child and insufficient for language acquisition. Hearing parents of DHH children often choose to learn NZSL alongside their child, as demonstrated by the quote from participant eight, "we learnt sign with our son when he was 1-2 and he was able to communicate with us using those signs …". This is a clear example of a parent/caregiver using an additional language for the benefit of their child. Despite NZSL often not being parents/caregivers *home language*, it may be the only language their child can access and successfully learn.

A further consideration is the revitalisation of te reo Māori (the indigenous language of Aotearoa New Zealand). Quin (2020), calling on the work of King and Cunningham

(2017), described that “most whānau who speak te reo Māori with their children are ‘new speakers’ and are working towards fluency themselves”. Parents/caregivers speaking in a non-fluent language are likely to provide children with a language model which is simplified, contains grammatical errors, and is reduced in quantity (Zauche et al., 2017). While concerns of non-fluent language modelling can be applied to both te reo Māori and NZSL, they should be balanced with the significant cultural benefit that these languages offer.

With this complex background, it may be unsurprising that participants scored lower on the item ‘w*hānau/parents should use the language they are most familiar with to their children’,* compared with other items relating to *bilingualism.* Participants who disagreed may have done so from a perspective of language as part of cultural identity. Disagree responses may also reflect a choice to model NZSL (when it is not parents’/caregivers’ *home language*) as an aid or alternative to spoken language in the presence of hearing loss.

Two items compared participant’s beliefs about the benefit or harm of the bilingualism for children with normal hearing and DHH children. Based on international literature, the following statements are false, *‘children with normal hearing should only learn one language at a time, so they don’t get confused’* and *‘Deaf or hard of hearing children should only learn one language at a time, so they don’t get confused’*. Participant responses aligned closely with international literature, scoring 86.1% for the first statement, and 80.6 for the second. It is interesting to note that a small number of participants (n = 2) believed that learning more than one language at a time was appropriate for children with normal hearing, but not for DHH children. There are well-established benefits of learning more than one language, such as executive function and educational achievement. (Zauche et al., 2017).

Participant reports of the languages their children were exposed to, provides further insight. Most children received bilingual language exposure (19), followed by trilingual (11), while only seven children received monolingual language exposure. Most children were

exposed to English (91.9%), which mirrors the number of English speakers in New Zealand (90%). Interestingly, 21.6% of children were exposed to Te Reo Māori, which is considerably higher than the number of Te Reo Māori speakers (3%) (Ministry for Ethnic Communities - Te Tari Mātāwaka, 2013). A high percentage of children were exposed to NZSL (71.3%). No statistics were found on the percentage of NZSL users in New Zealand.

Parent and Caregiver Beliefs About Language Development

In the present study participants identified *access to language* as the primary influence on DHH children learning language. This demonstrated participants' knowledge that children need ready access to language for both expressive and receptive language to develop. This differed from the findings by Gibson et al. (2020), that parents/caregivers of children from the general New Zealand population recognised themselves as the primary influence. This may indicate that parents/caregivers of DHH children hold a different perspective of child language development and may think more readily about their child's linguistic needs. This difference is made explicit through the quote from participant 24, "exposure (needing more exposure than hearing peers given less incidental listening)". Many participants valued the supports and services they had received, and others indicated the need for better access to these. As expected, *hearing* was mentioned in the present study, but by surprisingly few participants. This may indicate a lack of awareness by many participants, of the connection between hearing and spoken language acquisition. However, the opposite may also be true, that their child's hearing is so central in parents' and caregivers' minds that it felt too obvious to mention. *Hearing* was seldom noted in Gibson et al.'s study, and this is likely due to participants being recruited from the general population (hearing status was not reported by Gibson et al.). Beyond these differences, participants from the two studies appeared to share comparable views of the influences on child language development.

A comparison has been made between the beliefs of participants from Gibson et al. and the present study. However, participants were asked slightly different questions. In the present study, participants were asked, ‘what do you think are the main influences on DHH children learning to talk/sign?’ Participants from Gibson et al. were asked, ‘what do you think the main influences on your child's/children's speech and language development are?’ With wording from the present study listed first, the key differences to note are (a) ‘DHH children’ in contrast with ‘children’ (b) ‘children’ in contrast with ‘your child/children’ (c) ‘learning to talk/sign’ in contrast with ‘speech and language development’.

Parent/Caregiver Age

In the present study, older parents/caregivers demonstrated higher knowledge of child language development than parents who were younger. Overseas and New Zealand based research has indicated higher maternal age to be associated with better developmental outcomes for children (Falster et al., 2018; Fergusson & Woodward, 1999; Leigh & Gong, 2010). There does not appear to be a specific focus on the relationship between parent/caregiver age and knowledge of child language development, or early child language abilities of DHH children or those with normal hearing, in the literature. However, children of younger mothers were among those less likely to participate in B4 school checks (Gibb et al., 2019). Findings from this study indicate that younger parents/caregivers may have gaps in their knowledge of child development. Education about child language development and services that are available could be more directly targeted to younger parents and caregivers. Further research in this area is also indicated.

Parent/Caregiver Highest Level of Education

Both household income and parent level of education are frequently used as measures of SES. However, household income may vary during a child’s early years as one parent may take on the role of ‘stay at home parent’, resulting in a temporary reduction in income during

this time. Parent's/caregivers' seeking of information on child health and development has been demonstrated to vary in relation to their level of education (Jaks et al., 2019). Education level was, therefore, determined to be the more reliable measure for the purpose of this study (Pace et al., 2016).

Higher levels of parent/caregiver education were associated with increased consistency with the international literature on child language development. This aligns with findings from overseas (Gaziano, 2012; Rowe, 2008; Rowe et al., 2016) as well as New Zealand based research (Gibson et al., 2020) that parents and caregivers with higher levels of education are more knowledgeable about child development. Furthermore, higher parental education has been indicated as a mediating factor in language outcomes for both children with normal hearing (Alper et al., 2021; Dollaghan et al., 1999) and those who are DHH (Digby et al., 2021; Yoshinaga-Itano et al., 2017). Parents and caregivers of DHH children with lower levels of education may benefit from additional education on child language development.

These findings confirm the hypothesis that older parents and caregivers and those who hold higher level qualifications will likely have knowledge of child language development which aligns with the international literature, compared with parents and caregivers who are younger and hold lower-level qualifications.

DHH Child Related Factors

Research question three focused on variables relating to the child: their age, and presence and type of hearing amplification. No statistically significant relationship was found between these two variables and parent/caregiver knowledge of child language development. Over time and as their child ages, it may be expected that parents and caregivers of DHH children have more opportunities to increase their knowledge of child language development. However, it is possible that, following their child's diagnosis, parents/caregivers receive

information about child language development, which leads to immediate knowledge gains which do not continue to increase over time. Differences in parent's/caregivers' knowledge may also be expected due to service being based on hearing loss severity, for example, children who receive CIs are eligible to receive a more intensive service, including SLT, compared with children who use HAs or no device. However, these hypothesized increases in knowledge were not reflected in the results of the present study. While some difference was present between group averages for presence and type of hearing amplification, e.g., no device (mean = 19.8), HAs (mean = 20.8), CIs (mean = 22.4), these between group differences were not statistically significant. This may be in part due to to the small sample size and the variation in alignment with the literature present within each group.

Parent and Caregiver Decision Making

Parents and caregivers of DHH children must acquire and process information on hearing loss; language development; intervention options; and their individual child's needs. What is more, they must balance this information with their own beliefs and aspirations for their child (DesGeorges, 2016). These decisions begin with whether to participate in newborn hearing screening and continue following diagnosis and throughout childhood (Porter et al., 2018). Decisions may occur early on, such as deciding for or against HAs or CIs, or for or against spoken language and/or sign language. They may be ongoing, such as, whether to attend appointments, for example, audiology; OLR; SLT; AODC; and First Signs. Whether to reduce distractions and maximise signal to noise ratio by turning off the television or reducing background noise. Decisions are influenced by cultural values and beliefs as well as parent's/caregiver's knowledge of child development. However, as 90 to 95% of DHH children are born to hearing parents, these parents may have little prior experience or knowledge of hearing loss (DesGeorges, 2016; Porter et al., 2018).

Clinical Implications

Parents and caregivers hold the power in regard to decision making for their DHH child. However, they are influenced by their own cultural values and beliefs, knowledge of child development and sources of information (Decker et al., 2012; Erbasi et al., 2018; Porter et al., 2018; Scarinci, et al., 2018). Parent/caregiver knowledge and beliefs are associated with decisions for, or against cochlear implants and regarding communication modality – spoken and/or sign language (Porter et al., 2018). It may be assumed that parent/caregiver knowledge and beliefs also influence decisions to prioritise the quality and quantity of interactions, hearing amplification device use time, attending diagnostic and intervention appointments such as hearing screenings; audiology; ORL; SLT; AODC; and First Signs. These decisions are numerous and made in the midst of busy modern life. Parent and caregiver knowledge likely influences their daily decision making and these decisions can go on to impact their child's language development and later outcomes (Digby et al., 2004; Krug et al., 2016; Porter et al., 2018; Schrijver, 2004).

With the understanding of a critical period of language acquisition within the first few years of life (Mayberry et al., 2002) and that strong evidence that earlier access to language is better (Ching et al., 2010, 2018), intervention for DHH children needs to be preventative rather than reactive. Importantly, parents and caregivers of DHH children as well as children with normal hearing can learn and can modify their behaviour (Sowa et al., 2021; Suskind, 2016b). Information could be made more readily available, for example on websites of New Zealand organisations for DHH children. Based on the findings of this study, areas where parents/caregivers would benefit from further information, include education on vocabulary trajectories; the importance of rich vocabulary by age three years; joint attention; and high hearing amplification device use (aiming for 'all waking hours'). Also indicated, is education on how parent's and caregivers' *home language* offers the strongest linguistic model though,

their unique cultural context and child's hearing loss are important factors in language choice. Education in these areas of child language development may be beneficial to all parents and caregivers of DHH children.

Limitations and Directions for Future Research

A clear limitation of the present research is the small sample size, with over representation of parents and caregivers of higher education, and most participants being mothers (86.1%). This study aimed to collect data representative of the parents and caregivers of DHH children across New Zealand. Considerable effort went into establishing connections with DHH organisations prior to beginning recruitment, as well as advertising on social media, to reach a variety of participants during the two-month data collection period. Based on increases in response rates following advertising on social media, it is likely that many participants were already engaged members of DHH community social media groups. Individuals who were not part of these groups may be underrepresented in the data. However, likely due to the efforts made during recruitment, participants were of a age range of 23 to 47 years old, (mean = 36.1, SD = 5.8) and ethnicity data was reasonably representative of the demographics that make up the adult population of Aotearoa New Zealand. Future research could further the present findings by utilising the ELD-DHH survey to collect data from a larger more representative sample.

A second limitation is the complexity and length of two of the survey items previously discussed. Reducing the complexity, sentence length, and word length in these items would improve their readability. While the readability measures for the ELD-DHH were high, improving these two items would increase scores further. Improving readability would increase the accessibility of the survey to participants.

A final limitation is that the research team did not include a Deaf member or a parent/caregiver of a DHH child. However, the pilot survey was completed by a parent of a

DHH child. Consultation was also made with DHH organisations and professionals working with DHH people.

Future research could establish the usefulness of a survey such as the ELD-DHH as a clinical tool. Psychometric validation of the survey, following a process such as the one undertaken by Suskind et al. (2018), would be recommended prior to clinical use. Determining associations between survey scores and important modifiable behavious such as quality and quantity and parent-child interaction, hearing amplification device use, and attending diagnostic and intervention appointments, would be important for clinical use. Following diagnosis of hearing loss for a child, parents' and caregivers' baseline knowledge and beliefs about child language development could be established via a survey such as the ELD-DHH. The information gathered could be used to identify parents and caregivers who may benefit from additional support, providing more individualised support based on areas of child language development where knowledge is strong and areas where gaps in knowledge are present. Survey information gathered on beliefs could be used to shape support in a family centred approach. This aligns with a model of early identification and intervention, whereby those with lower knowledge could be identified early, and anticipatory guidance (Leung & Suskind, 2020) provided. Future New Zealand based research into parents/caregivers of DHH children's knowledge of child language development as a lever for change in behaviours that impact DHH children's language development would be a worthwhile endeavour.

Conclusion

This study contributes uniquely to the literature by examining knowledge and beliefs about child language development, in a population not previously studied: parents and caregivers of DHH children in New Zealand. In doing so, it sought to identify (a) groups that may benefit from further support, and (b) specific areas of child language development where parent/caregiver views differed from the current literature base. Parent/caregiver knowledge of child language development has been demonstrated to be positively associated with children's language skills (Alper et al., 2021). On the ELD-DHH survey, participants who were younger in age or with lower levels of education tended to have lower scores, suggesting that they may benefit from targeted education on child language development. Specific areas where educational supports were indicated for the group as a whole included vocabulary trajectories; the importance of rich vocabulary by three years of age; joint attention; aiming for children to wear their HA and CIs 'all waking hours'; and an adult's *home language* offers the strongest linguistic model, offered to all parents and caregivers of DHH children. This research makes an important contribution to the literature base on facilitators of language outcomes for DHH children in New Zealand. Knowledge of child language development gives parents and caregivers of DHH children the power to provide a language rich home environment and to make choices that will positively influence their child's future.

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Appendices

Appendix A: Ethics Approval

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Ref: HEC 2021/149

9 November 2021

Ellen McKee
School of Psychology, Speech and Hearing
UNIVERSITY OF CANTERBURY

Dear Ellen

The Human Ethics Committee advises that your research proposal "Exploring the Knowledge and Beliefs about Child Language Development Held By Parents/Caregivers of Deaf Children and Children Who are Hard of Hearing Living in New Zealand" has been considered and approved.

Please note that this approval is subject to the incorporation of the amendments you have provided in your email of 3rd November 2021.

Best wishes for your project.

Yours sincerely

Dr Dean Sutherland
Chair
University of Canterbury Human Ethics Committee

Ngāi Tahu Consultation and Engagement Group

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

2 November 2021

Tēnā koe Ellen

Re: Exploring the knowledge and beliefs about child language development held by parents/caregiver of Deaf and hard of hearing children in New Zealand.

This letter is on behalf of the Ngāi Tahu Consultation and Engagement Group (NTCEG). The NTCEG considered your proposal and acknowledge it is a worthwhile and interesting project and you are clear that there may or may not be Māori participants involved.

After consulting you were able to take your approach one step further and consider how you ought to take participants' (cultural) needs into account if and when applicable. Given the scope of your project, no issues have been identified and further consultation with Māori is not required.

Thank you for engaging with the Māori consultation process. This will strengthen your research proposal, support the University's Strategy for Māori Development, and increase the likelihood of success with external engagement. It will also increase the likelihood that the outcomes of your research will be of benefit to Māori communities. We wish you all the best with your current project and look forward to hearing about future research plans.

The Ngāi Tahu Consultation and Engagement Group would appreciate a summary of your findings on completion of the current project. Please feel free to contact me if you have any questions.

Ngā mihi
Sarah Wiki-Bennett (on behalf of the NTCEG)

Research & Innovation | Te Rōpū Rangahau
University of Canterbury | Te Whare Wānanga o Waitaha
Private Bag 4800, Christchurch | Ōtautahi
ethicsmaoriconsultation@canterbury.ac.nz

Appendix B: Study advertisements

Kia ora,

You are receiving this information because you work with Deaf or hard of hearing children. My name is Ellen McKee, and I am a speech-language therapist. I am seeking support in sharing a survey with parents/caregivers of children on your caseload. The purpose of this research is to explore what Parents/caregiver of Deaf or hard of hearing children know and believe about child language development. This study is being carried out as a requirement of the Master of Audiology programme at the Te Whare Wānanga o Waitaha - the University of Canterbury.

Who can complete the survey?
Participants must be 18 years or older and be parent/caregivers of Deaf or hard hearing children aged 0 to 5-years-old, living in New Zealand.

What are the benefits?
This study has potential benefits for parents/caregivers of Deaf or hard of hearing children, and the service providers who support them. This study aims to add to our kete of knowledge on how to best support the families and whānau we work with.

While your support of this project is greatly appreciated, it is completely voluntary. Parents/caregivers participation is also voluntary.

Please see below the information and survey link to share with the parents/caregivers of children on your caseload, who meet the criteria for this research.

For more information or if you have any questions please contact:
Project researcher ellen.mckee@pg.canterbury.ac.nz
Project supervisors jayne.newbury@canterbury.ac.nz or mike.maslin@canterbury.ac.nz

Ngā mihi nui,

Ellen McKee

Survey link:_____

Kia ora,

My name is Ellen McKee, and I am a speech-language therapist. I am interested in what helps Deaf or hard of hearing children learn to talk/sign. You are invited to complete my survey if you are aged 18 years or older and are a parent/caregiver of a Deaf or hard of hearing child aged 0 to 5 years, living in New Zealand. Participation is voluntary (it's up to you). The survey will contribute toward my Master of Audiology research at the Te Whare Wānanga o Waitaha - the University of Canterbury.

For more information or if you have any questions please contact:
Project researcher ellen.mckee@pg.canterbury.ac.nz
Project supervisors jayne.newbury@canterbury.ac.nz or mike.maslin@canterbury.ac.nz

Survey link:

Ngā mihi nui,

Ellen McKee

Appendix C: Participants information and consent

UC School of Psychology Speech and Hearing
Phone: 03 369 4333
Email: ellen.mckee@pg.canterbury.ac.nz
Date: TBC
HREC Ref: TBC

Parents & caregivers' knowledge and beliefs about how Deaf or hard of hearing children learn to talk/sign?
Information sheet for participants

Kia ora,

Thank you for your interest in my survey! My name is Ellen, and I am a speech-language therapist. I invite you to participate in my survey on how parents and caregivers can help Deaf or hard of hearing children learn to talk/sign. This study is being carried out as a requirement of the Master of Audiology programme at the Te Whare Wānanga o Waitaha - the University of Canterbury.

What is involved?
Participation is voluntary and involves completing an anonymous online survey which will take around 10 to 15 minutes. The survey involves answering questions about you and your Deaf or hard of hearing child. There are 30 multiple-choice, and two short answer questions about how children learn to talk/sign. This includes 17 multiple-choice questions from a survey that has been used with parents/caregivers in the USA. The results will be compared by socio-economic status.

The purpose of this research is to explore what Parents/caregivers of Deaf or hard of hearing children know and believe about how children learn to talk/sign. The information from this study will help to inform the services and supports that are available to these children and their families.

Who can participate in the survey?
You are invited to participate if you are aged 18 years or older and are a parent/caregiver of a Deaf child or child who is hard of hearing aged 0 to 5-years-old, living in New Zealand. The survey is not restricted to one parent/caregiver, and we welcome others in your household to participate by completing a separate survey.

What are the benefits?
This study has potential benefits for parents/caregivers of Deaf children and children who are of hearing, and the service providers who support them. This study aims to help service providers better understand the needs of New Zealand parents/caregivers of Deaf or hard of hearing children. We also aim to inform the improvement of services that are currently available.

What is the prize draw?
After completing the survey, you can choose to enter a random prize draw to win one of 4x $50 fuel vouchers. To keep your survey response anonymous, this will involve clicking a link that will take you to another page. Your contact details can be entered on this separate page, which is not linked to your survey responses. Your contact details will only be used if you win a prize. They will be deleted after winners are notified.

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What will happen to the information you provide?
All data will be anonymous. We will not be able to identify you or link your identity with any responses you provide. All data will be stored on the University of Canterbury's computer network in password-protected files. All data will be destroyed five years after the completion of the study. Ellen McKee will be responsible for making sure that only members of the research team use your data for the purposes mentioned in this information sheet.

Will the results of the study be published?
The results of this research will be published in a Masters thesis. This thesis will be available to the general public through the UC library. Results may be published in peer-reviewed, academic journals. Results may also be presented during conferences or seminars to wider professional and academic communities. Publications may include anonymous quotes from participant survey responses. You and any organisation you mention will not be identified in any publication. You will be given the option to be sent a summary of the research. If you provide an email address for this purpose, it will not be linked with your survey responses.

What if you change your mind during or after the study?
You are free to withdraw at any time. To do this, simply close the internet browser window that the survey is presented on. Any information you have entered up to that point will be deleted from the data set. This survey is anonymous. This means that once you have submitted you will not be able to withdraw your response, as we will not be able to identify which response is yours.

Are there any potential risks involved in this research?
The questions in this survey are not intended to cause distress. However, some questions ask you to consider sensitive or personal information about Deaf or hard of hearing children. This may cause some participants to become upset or distressed. If you become upset or distressed we recommend you consider stopping the survey. You may also want to consider contacting one of the support agencies listed below.

Counselling support:

Parent Help:	0800 568 856 https://www.parenthelp.org.nz/
Yellow Brick Road:	0800 876 682 https://yellowbrickroad.org.nz/

Support for Deaf or hard of hearing children and their parents:

Deaf Aoteara – Tangata Turi	0800 33 23 22 https://www.deaf.org.nz/
Deaf Children New Zealand - Tamariki Turi O Aotearoa	0800 332 324 https://deafchildren.org.nz/

Appendix D: Demographic Questions, ELD-DHH Survey, and Prize draw

What is your age?

_____

In what country do you live?

- ○ Aotearoa New Zealand (4)
- ○ Other (5)

What is your ethnicity? You can select multiple.

- ☐ Pakeha/New Zealand European (1)
- ☐ Māori (2)
- ☐ Pacific peoples (3)
- ☐ Asian (4)
- ☐ Middle Eastern (5)
- ☐ Latin American (6)
- ☐ African (7)
- ☐ Other (8) _____

What is your occupation?

_____

What is your highest level of education?

- ○ No formal qualification (1)
- ○ NCEA level 1, 2, 3, and/or School Certificate, University Entrance or Bursary (2)
- ○ Certificate, diploma or apprenticeship (please give the name and level of your qualification) (4) _____
- ○ Bachelor's degree (3 years) (5)
- ○ Honours or post graduate qualification (6)
- ○ Other (please list or describe) (7) _____

What is your total household income?

- ○ Less than $17,026 (1)
- ○ $17,026 to $30,006 (2)
- ○ $30,007 to $41,582 (3)
- ○ $41,583 to $55,524 (4)
- ○ $55,525 to 94,847 (5)
- ○ $94,848 or over (6)

What is your hearing status?

- ○ Hearing (1)
- ○ Hard of hearing (2)
- ○ Deaf (3)

How many Deaf or hard of hearing children aged 0 to 5 do you have?

- ○ 0 (1)
- ○ 1 (2)
- ○ 2 (3)
- ○ 3 (4)
- ○ 4 (5)
- ○ 5 (6)

How old is your Deaf child or your child who is hard of hearing?
You may select more than one for multiple children.

- ☐ 0 - 1 year old (1)
- ☐ 1 year old (2)
- ☐ 2 years old (3)
- ☐ 3 year old (4)
- ☐ 4 year old (5)
- ☐ 5 year old (6)
- ☐ Additional information (7) _____

Is your child Deaf or hard of hearing in one or both ears?

	One ear (1)	Both ears (2)
0 - 1 year old (x1)	○	○
1 year old (x2)	○	○
2 years old (x3)	○	○
3 year old (x4)	○	○
4 year old (x5)	○	○
5 year old (x6)	○	○
Additional information (x7)	○	○

Please describe your child's level of hearing. You can find this information in reports from their Audiologist. However, please feel free to describe in your own words.

○ 0 - 1 year old (1) _____

○ 1 year old (2) _____

○ 2 years old (3) _____

○ 3 year old (4) _____

○ 4 year old (5) _____

○ 5 year old (6) _____

○ Additional information (7)

_____

How old was your child when they were diagnosed with a hearing difficulty?

	0 to 3 months (1)	3 months to 1 year (2)	1 year (3)	2 years (4)	3 years (5)	4 years (6)	5 years (7)
0 - 1 year old (x1)	○	○	○	○	○	○	○
1 year old (x2)	○	○	○	○	○	○	○
2 years old (x3)	○	○	○	○	○	○	○
3 year old (x4)	○	○	○	○	○	○	○
4 year old (x5)	○	○	○	○	○	○	○
5 year old (x6)	○	○	○	○	○	○	○
Additional information (x7)	○	○	○	○	○	○	○

Does your child wear hearing aids or do they have cochlear implants?
You may select both.

	Hearing aids (1)	Cochlear implants (2)	Neither (3)
0 - 1 year old (x1)	☐	☐	☐
1 year old (x2)	☐	☐	☐
2 years old (x3)	☐	☐	☐
3 year old (x4)	☐	☐	☐
4 year old (x5)	☐	☐	☐
5 year old (x6)	☐	☐	☐
Additional information (x7)	☐	☐	☐

How many hours per day on average does your child wear their hearing aids or cochlear implant processor?

- ○ 0 - 1 year old (1) _____
- ○ 1 year old (2) _____
- ○ 2 years old (3) _____
- ○ 3 year old (4) _____
- ○ 4 year old (5) _____
- ○ 5 year old (6) _____
- ○ Additional information (7) _____

Is your child / are your children receiving or have they received support from any of the following services?

- ☐ Audiology (1)
- ☐ Advisors on Deaf children (AODC) (2)
- ☐ First signs (3)
- ☐ New Zealand sign language (NZSL) tutor (4)
- ☐ Speech language therapy (SLT) (5)
- ☐ Occupational therapy (OT) (6)
- ☐ Physiotherapy (PT) (7)
- ☐ Psychology (8)
- ☐ Ko Taku Reo - Deaf Education Centre (tick for services other than receiving batteries) (9)
- ☐ The Hearing House (10)
- ☐ None of the above (11)
- ☐ Other (please describe) (12)

_____

Does your child / do your children have any medical diagnosis or conditions other than being Deaf or hard of hearing?

- ○ No (1)
- ○ Yes (Please list) (2) _____

How do you and others in your child's life communicate with your child?

- ☐ New Zealand sign language (NZSL) (1)
- ☐ Te reo Māori (2)
- ☐ English (3)
- ☐ Tongan (4)
- ☐ Samoan (5)
- ☐ Hindi (6)
- ☐ Cantonese (7)
- ☐ Mandarin (8)
- ☐ Other (please list) (9)

_____

Over the course of a week, on average how often do you and others in your child's life use each language with your child?

	(1-10% of the time) (1)	(10-30% of the time) (2)	(30-60% of the time) (3)	(60-90% of the time) (4)	(90-100 % of the time) (5)
New Zealand sign language (NZSL) (x1)	○	○	○	○	○
Te reo Māori (x2)	○	○	○	○	○
English (x3)	○	○	○	○	○
Tongan (x4)	○	○	○	○	○
Samoan (x5)	○	○	○	○	○
Hindi (x6)	○	○	○	○	○
Cantonese (x7)	○	○	○	○	○
Mandarin (x8)	○	○	○	○	○
Other (please list) (x9)	○	○	○	○	○

What is your relationship with your Deaf or hard or hearing child?

- ☐ Mother (1)
- ☐ Father (2)
- ☐ Step parent (3)
- ☐ Grandparent (4)
- ☐ Legal caregiver/guardian (5)
- ☐ Other (please describe) (6)

_____

The following questions are about how you believe children learn to talk/sign.

When do you think a child is ready to be exposed to words/signs?

- ○ As an infant (0 to 6 months) (1)
- ○ As a baby (6 to 12 months) (2)
- ○ As a toddler (1 to 3 years) (3)
- ○ In early childhood (3 to 5 years) (4)
- ○ In their first year of school (5 to 6 years) (5)
- ○ Later in school (6 years and up) (6)

When do you think a child is ready to be exposed to reading and books?

- ○ As an infant (0 to 6 months) (1)
- ○ As a baby (6 to 12 months) (2)
- ○ As a toddler (1 to 3 years) (3)
- ○ In early childhood (3 to 5 years) (4)
- ○ In their first year of school (5 to 6 years) (5)
- ○ Later in school (6 years and up) (6)

When do you think a child is ready to be exposed to shapes and sizes?

- ○ As an infant (0 to 6 months) (1)
- ○ As a baby (6 to 12 months) (2)
- ○ As a toddler (1 to 3 years) (3)
- ○ In early childhood (3 to 5 years) (4)
- ○ In their first year of school (5 to 6 years) (5)
- ○ Later in school (6 years and up) (6)

Please indicate how much you agree or disagree with each statement.

	Strongly agree (6)	Somewhat agree (7)	Neither agree nor disagree (8)	Somewhat disagree (9)	Strongly disagree (10)
Babies learn a lot about language in the first six months of their life. (1)	○	○	○	○	○
Responding to a baby every time he or she cries will only end up spoiling him or her. (2)	○	○	○	○	○
How smart a baby will become depends mostly on his or her genetics. (3)	○	○	○	○	○

Please indicate how much you agree or disagree with each statement.

	Strongly agree (6)	Somewhat agree (7)	Neither agree nor disagree (8)	Somewhat disagree (9)	Strongly disagree (10)
Toddlers learn more when they are told exactly what to do instead of being given choices. (1)	○	○	○	○	○
When toddlers can follow directions like ‘Go get your shoes’ this means they can also say those words out loud. (2)	○	○	○	○	○
Answering only if a toddler uses words instead of just pointing better helps the toddler learn how to talk. (3)	○	○	○	○	○

Please indicate how much you agree or disagree with each statement.

	Strongly agree (6)	Somewhat agree (7)	Neither agree nor disagree (8)	Somewhat disagree (9)	Strongly disagree (10)
The things a young child learns before he or she goes to school are important for later learning. (1)	○	○	○	○	○
Children learn fewer words/signs when they don’t pay attention to what you’re saying/signing. (2)	○	○	○	○	○
How well a young child will do in school depends mostly on the natural intelligence he or she is born with. (3)	○	○	○	○	○

Page Break

Think about 3-year-olds talking/signing.

	Strongly agree (6)	Somewhat agree (7)	Neither agree nor disagree (8)	Somewhat disagree (9)	Strongly disagree (10)
The amount that whānau talk/sign with their child in their first 3 years of life can predict the number of words/signs they will know at age 3. (1)	○	○	○	○	○
How many words/signs a 3-year-old knows can predict how well they might do in their first year of school. (2)	○	○	○	○	○
How many words/signs a 3-year-old knows cannot predict how many new words/signs they will learn during their lifetime. (3)	○	○	○	○	○
Children who know fewer words/signs when they start school will probably do worse in year four than their classmates who know more words/signs. (4)	○	○	○	○	○

Page Break

Think about children learning more than one language.

	Strongly agree (6)	Somewhat agree (7)	Neither agree nor disagree (8)	Somewhat disagree (9)	Strongly disagree (10)
Whānau/parents should use the language they are most familiar with to their children. (1)	○	○	○	○	○
Children with normal hearing should only learn one language at a time, so they don't get confused. (2)	○	○	○	○	○
Deaf or hard of hearing children should only learn one language at a time, so they don't get confused. (3)	○	○	○	○	○

Think about reading books with toddlers.

	Strongly agree (6)	Somewhat agree (7)	Neither agree nor disagree (8)	Somewhat disagree (9)	Strongly disagree (10)
Letting a toddler move around while listening to a story teaches the toddler bad listening skills. (1)	○	○	○	○	○
Letting a toddler skip words and pages teaches the toddler bad reading habits. (2)	○	○	○	○	○

Think about children's screen time.

	Strongly agree (6)	Somewhat agree (7)	Neither agree nor disagree (8)	Somewhat disagree (9)	Strongly disagree (10)
Toddlers can learn more from being read to by their parents than they can from educational screen time. (1)	○	○	○	○	○
Children 0 to 2-years-old can learn just as many words/signs from educational TV as they can from their parents. (2)	○	○	○	○	○
Leaving the TV on in the background is a great way to give 0 to 2-year-olds extra chances to learn new words/signs. (3)	○	○	○	○	○
Having conversations with adults during screen time can help 3-year-olds learn new words/signs. (4)	○	○	○	○	○

The following questions are related to Deaf or hard of hearing children who are learning spoken language.

○ I am happy to continue with these questions. (1)

○ I would like to skip these questions as my child is learning sign and not spoken language. (2)

Skip To: End of Block If The following questions are related to Deaf or hard of hearing children who are learning spoken l... = I would like to skip these questions as my child is learning sign and not spoken language.

Think about Deaf or hard of hearing children wearing hearing aids or cochlear implants.

	Strongly agree (6)	Somewhat agree (7)	Neither agree nor disagree (8)	Somewhat disagree (9)	Strongly disagree (10)
It is best for children to have regular breaks from listening with their hearing aids or cochlear implants throughout the day. (1)	○	○	○	○	○
When spoken language is the aim, children who are hard of hearing should start wearing hearing aids as young as possible. (2)	○	○	○	○	○
Without hearing aids, children with mild hearing difficulties and children with severe hearing difficulties are likely to do equally well in school. (4)	○	○	○	○	○
When Deaf or hard of hearing children wear hearing aids or cochlear implants they hear as well as children with normal hearing. (5)	○	○	○	○	○
When wearing hearing aids/cochlear implants, Deaf or hard of hearing children hear equally well in noisy versus quiet environments. (6)	○	○	○	○	○

What do you think are the main influences on Deaf or hard of hearing children learning to talk/sign?

_____
_____
_____
_____
_____

What barriers have you faced in supporting your Deaf or hard of hearing child learning to talk/sign?

_____
_____
_____
_____
_____

End of Block: Block 5

Start of Block: Block 6

Thank you for completing the survey. Please submit your results by clicking below.

SUBMIT SURVEY

Appendix 7.
Qualtrics survey - Prize draw and research summary

Prize draw & research summary

Your survey responses are anonymous and cannot be linked to you should you choose to enter the prize draw or receive a summary of the results of this research. If you do not wish to do either you may end the survey by closing your internet browser now.

- ☐ I would like to enter the prize draw to win one of 4x $50 fuel vouchers.
- ☐ I would like to be emailed a summary of the results of this research.

Email address

_____

Phone number (optional)

_____

Appendix E: Scores on the ELD-DHH Survey

Item no.	Item	Correct response according to international literature	Raw score	Percentage
1	When do you think a child is ready to be exposed to words/signs?	As an infant (0 to 6 months) As a baby (6 to 12 months)	35	97.2
2	When do you think a child is ready to be exposed to reading and books?	As an infant (0 to 6 months) As a baby (6 to 12 months)	36	100.0
3	When do you think a child is ready to be exposed to shapes and sizes?	As an infant (0 to 6 months) As a baby (6 to 12 months)	34	94.4
1	Babies learn a lot about language in the first six months of their life.	Agree	35	97.2
5	Responding to a baby every time he or she cries will only end up spoiling him or her.	Disagree	28	77.8
6	How smart a baby will become depends mostly on his or her genetics.	Disagree	22	61.1
7	Toddlers learn more when they are told exactly what to do instead of being given choices.	Disagree	26	72.2
8	When toddlers can follow directions like ‘Go get your shoes’ this means they can also say those words out loud.	Disagree	30	83.3
9	Answering only if a toddler uses words instead of just pointing better helps the toddler learn how to talk.	Disagree	33	91.7
10	The things a young child learns before he or she goes to school are important for later learning.	Disagree	33	91.7
11	Children learn fewer words/signs when they don’t pay attention to what you’re saying/signing.	Disagree	13	36.1
12	How well a young child will do in school depends mostly on the natural intelligence he or she is born with.	Disagree	29	80.6
13	The amount that whānau talk/sign with their child in their first 1 years of life can predict the number of words/signs they will know at age 1.	Agree	24	66.7
14	How many words/signs a 3-year-old knows can predict how well they might do in their first year of school.	Agree	17	47.2
15	How many words/signs a 3-year-old knows cannot predict how many new words/signs they will learn during their lifetime.	Disagree	9	25.0
16	Children who know fewer words/signs when they start school will probably do worse in year four than their classmates who know more words/signs.	Agree	14	38.9
17	lWhānau/parents should use the language they are most familiar with to their children.	Agree	19	52.8
18	Children with normal hearing should only learn one language at a time, so they don’t get confused.	Disagree	31	86.1
19	Deaf or hard of hearing children should only learn one language at a time, so they don’t get confused.	Disagree	29	80.6

Item no.	Item	Correct response according to international literature	Raw score	Percentage
20	Letting a toddler move around while listening to a story teaches the toddler bad listening skills.	Disagree	25	69.4
21	Letting a toddler skip words and pages teaches the toddler bad reading habits.	Disagree	25	69.4
22	Toddlers can learn more from being read to by their parents than they can from educational screen time.	Agree	24	66.7
23	Children 0 to 2-years-old can learn just as many words/signs from educational TV as they can from their parents.	Disagree	24	66.7
24	Leaving the TV on in the background is a great way to give 0 to 2-year-olds extra chances to learn new words/signs.	Disagree	27	75.0
25	Having conversations with adults during screen time can help 3-year-olds learn new words/signs.	Agree	23	63.9
26	It is best for children to have regular breaks from listening with their hearing aids or cochlear implants throughout the day.	Disagree	13	37.1
27	When spoken language is the aim, children who are hard of hearing should start wearing hearing aids as young as possible.	Agree	33	94.3
28	Without hearing aids, children with mild hearing difficulties and children with severe hearing difficulties are likely to do equally well in school.	Disagree	23	65.7
29	When Deaf or hard of hearing children wear hearing aids or cochlear implants they hear as well as children with normal hearing.	Disagree	21	60.0
30	When wearing hearing aids/cochlear implants, Deaf or hard of hearing children hear equally well in noisy versus quiet environments.	Disagree	31	88.6