Spoken Language Multilingualism in Deaf Children

This thesis is submitted for the degree of Doctor of Philosophy

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Declaration

Declaration: I confirm that this is my own work completed under the supervision of Professor Ludovica Serratrice and Professor Vesna Stojanovik. The use of all material from other sources has been properly and fully acknowledged.

Emily Sarah Wright – 13.12.2022

Abstract

An increasing number of D/deaf children are born to multilingual parents who must decide whether to raise them with spoken language multilingualism (SLM). This PhD comprises three studies designed around the evidence-based practice framework to support professionals in their role in helping multilingual parents make informed communication decisions.

Study 1 investigates the beliefs of 108 professionals on SLM in deaf children and what advice they give to parents. Study 2 explores the decision-making process around SLM in deaf children from the parents' perspective through 14 semi-structured interviews. Study 3 examines the language and cognitive abilities of five deaf children with SLM compared to five oral monolingual deaf children, five hearing monolingual children and five hearing multilingual children.

Results from study 1 found that most professionals believed deaf children can achieve SLM and would advise parents to speak their home language. However, in study 2, whilst parents greatly valued professional advice, they reported receiving mixed advice on SLM. They also had a strong desire to speak their home language to provide better language models and support the child's cultural identity and family relationships. Study 3 suggests that deaf children can achieve SLM. Although expressive vocabulary skills in English were lowest for the deaf children with SLM, three out of five scored above average compared to monolingual test norms. Morphosyntactic abilities in English and parental self-rating of abilities in the home language, were also comparable to the multilingual hearing children. Finally, deaf children with SLM had similar executive function and Theory of Mind abilities to the other three groups.

The decision-making process around SLM is complex for multilingual parents of deaf children and professionals play a key role. The three studies will help professionals engage in evidence-based practice when supporting multilingual parents of deaf children to make informed decisions regarding SLM.

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Wright, E., Stojanovik, V., & Serratrice, L. (Submitted December 2022). Language, theory of mind, and executive function skills in deaf children with spoken language multilingualism. *Deafness & Education International*.

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List of Abbreviations

ABIs	Auditory Brainstem Implants
ANSD	Auditory Neuropathy Spectrum Disorder
APA	American Psychological Association
ASL	American Sign Language
AVT	Auditory Verbal Therapy
AVTUK	Auditory Verbal Therapy UK
BAA	British Academy of Audiology
BATOD	British Association of Teachers of the Deaf
BRI	Behavioural Regulation Index
BRIEF	Behaviour Rating Inventory of Executive Function
BSA	British Society of Audiology
BSL	British Sign Language
CCTT 1 & 2	Children's Color Trails Test 1 and 2
CELF-5	Clinical Evaluation of Language Fundamentals – Fifth Edition
CELF-Preschool	Clinical Evaluation of Language Fundamentals-Preschool
CI	Cochlear Implant
CICS	Cochlear Implanted Children's Support Group
CMV	Cytomegalovirus
CRIDE	Consortium for Research into Deaf Education
dB	Decibel
DELTA	Deaf Education through Listening and Talking

DLD	Developmental Language Disorder
EAL	English as an Additional Language
EF	Executive Function
ENT	Ear Nose and Throat
EOWPVT-4	Expressive One Word Picture Vocabulary Test – Fourth Edition
FLP	Family Language Policy
GEC	Global Executive Composite
GP	General Practitioner
HA	Hearing Aid
Hz	Hertz
LITMUS-SRep task	LITMUS sentence repetition task
MI	Metacognition Index
NatSip	National Sensory Impairment Partnership
NDCS	National Deaf Children's Society
NHS	National Health Service
NICE	National Institute for Health and Care Excellence
OME	Otitis Media with Effusion
OPOL	One Person One Language
PGCU	Percent Grammatical Communication Units
PLS-4	Preschool Language Scales 4th edition
PODC	Parents of Deaf Children/Parent of a Deaf Child
POHC	Parents of Hearing Children/Parent of a Hearing Child
QToD	Qualified Teacher of the Deaf
RCSLT	Royal College of Speech and Language Therapists

SD	Standard Deviation
SEN	Special Educational Needs
SES	Socio-Economic Status
SLM	Spoken Language Multilingualism
SLP	Speech and Language Pathologist
SLT	Speech and Language Therapist
SOLOM	Student Oral Language Observation Matrix
SSE	Sign Supported English or Signs Supporting English
STASS	South Tyneside Assessment of Syntactic Structures
SVO	Subject Verb Object
TD	Typically Developing
TEGI	Test of Early Grammatical Impairment
ToD	Teacher of the Deaf
ToM	Theory of Mind
ToMI-2	Theory of Mind Inventory-2
ToMTB	Theory of Mind Task Battery
WISC-IV UK	Wechsler Intelligence Scale for Children, Fourth UK Edition

Chapter 1: Introduction

1.1.Introduction

The cultural and linguistic diversity among deaf children is increasing globally. In the UK, 13% of all deaf children use at least one other spoken language at home in addition to English, with or without a signed language as well (Consortium for Research into Deaf Education [CRIDE], 2021). The term “spoken language multilingualism (SLM)” will be used in this thesis to refer to these children. In some parts of the UK this figure is far higher; in London, Great Ormond Street Cochlear Implant Centre reported that 28% of children receiving cochlear implants were from families who use a spoken language other than English (Mahon et al., 2011).

The languages a family choose to use within their home and among wider family members can be described in terms of a family language policy (King et al., 2008). For multilingual parents of deaf children, the issue of family language policy exists both in terms of decisions relating to their relationship with the Deaf community by introducing a signed language, and the maintenance of their home language(s). As the majority of deaf children are born to parents with typical hearing and therefore limited/no knowledge or experience of deafness (Mitchell & Karchmer, 2004), the decision-making process around communication choice for their deaf child is often complex and influenced by many internal and external factors. These can include the child’s audiological profile, such as the severity of their deafness and type of technology used, the family’s own communication preference for their deaf child and the information they receive (Ching et al., 2018; Crowe, Fordham, et al., 2014; Crowe, McLeod, et al., 2014).

As a result, professionals working with deaf children, both in education and health care, play a key role and the advice they provide to parents can be highly influential (Crowe, Fordham, et al., 2014; Crowe, McLeod, et al., 2014; Decker et al., 2012; Steinberg et al., 2003). The international consensus statement on best practices in family-centred intervention for deaf children, put forward by an international panel of experts in 2012, highlights the importance of professionals in supporting informed choice within parental decision-making by providing relevant and timely information to parents (Moeller et al., 2013). With regards to SLM, the statement also emphasises that professionals must “promote linguistic accessibility and home languages” (Moeller et al., 2013, p.437).

There are several clinical approaches to facilitating decision-making, and shared decision-making is now viewed as the standard for good practice (Porter et al., 2018), where “clinicians and patients share the best available evidence when faced with the task of making decisions, and where patients are supported to consider options, to achieve informed preferences” (Elwyn et al., 2012, p. 1361). When professionals give advice to patients and/or their families as part of the shared decision-making process, they must comply with evidence-based practice by integrating “the best available research with clinical expertise in the context of patient characteristics, culture, and preferences” (American Psychological Association (APA), 2006, p. 273).

However, providing evidence-based advice to parents regarding SLM in deaf children can be challenging for professionals. When deciding how to communicate with their child, parents often want to know what the potential long-term outcomes are for each option (e.g. spoken and sign language). In terms of language outcomes for deaf children who are raised with multiple spoken languages (with or without a signed language as well), research is limited, none of it is with a UK population, and language outcomes vary greatly (e.g. Bunta et al., 2016; Forli et al., 2018; Keilmann et al., 2019; Yim, 2012).

In addition, no research has been conducted in the UK, and there are very few studies worldwide, on the decision-making process regarding SLM in deaf children from the professionals' or parents' perspective. Professionals need to understand the factors that influence the decisions multilingual parents of deaf children make in order to provide advice that takes into consideration the family's values, preferences, and culture. It is also equally important to understand the beliefs of professionals in the UK on SLM in deaf children and what advice they provide to parents to ensure they are working in line with evidence-based practice and best practices for family-centred early intervention.

1.2. Scope of thesis

This thesis aims to provide a novel contribution to the evidence base on SLM in deaf children by focusing on this population in the UK, a context that has not yet been researched. Specifically, this thesis targets the decision-making process around SLM for deaf children, the role that professionals play in these decisions and the need for further research on language and cognitive outcomes in this population in order for professionals to be able to provide evidence-based advice. To achieve this, the evidence-based practice framework has been used to structure the thesis, with each of the three studies targeting one of the three components of evidence-based practice: professional expertise, the perspective of the client/client's family, and use of the best available research evidence on outcomes. This approach therefore aims to facilitate professionals in engaging in evidence-based practice when supporting multilingual parents of deaf children to make informed decisions regarding SLM.

First, the current beliefs and practices of professionals who work with deaf children with SLM in the UK will be examined to see how professional expertise is being applied when advising multilingual parents on SLM. Second, the decision-making process around SLM will be explored from the perspective of multilingual parents to identify their beliefs, values and preferences, and how the factors that influence their decisions compare to multilingual parents of hearing children. Third, to support professionals in providing evidence-based advice, the language and cognitive abilities of deaf children with SLM will be assessed and compared to deaf oral monolingual children, hearing monolingual children and hearing multilingual children.

1.3. Thesis structure

This thesis consists of seven chapters. The first two chapters introduce the topic and outline the scope of the thesis. Chapter 2 provides a background on deafness and sets the context of paediatric deafness in the UK. An overview of the existing literature on SLM in deaf children is then discussed both in relation to the decision-making process around communication choice, including the role that professionals play, and the development of language and cognition in this population. Gaps in the research are identified and consequently the rationale for this thesis is presented. Chapter 3 provides a detailed discussion of the methodological approaches used, with reference to the impact that the Covid-19 pandemic has had and the challenges of completing research on deaf children with SLM.

Chapters 4 to 6 present three studies focusing on professionals who work with deaf children with SLM, parents of deaf children with SLM and deaf children with SLM. Chapter 4 reports the beliefs of 108 professionals in the UK, specifically speech and language therapists, Teachers of the Deaf, and audiologists, on the ability of a deaf child to develop two spoken languages, and the advice they provide to multilingual parents who are considering raising their deaf child with their home language in addition to English. Chapter 5 presents the decision-making experiences of seven multilingual parents of deaf children and eight multilingual parents of hearing children, focusing on what factors influenced their decision to raise their child with multiple spoken languages and how they compare between the two groups. In chapter 6, data on the language and cognitive abilities of five deaf children with SLM are reported and compared to five deaf oral monolingual children, five hearing monolingual children and five hearing multilingual children. This chapter focuses specifically on vocabulary and morphosyntactic abilities in English, informal assessment of the home language, executive function and Theory of Mind.

Chapter 7 brings together the three studies and provides an overview of the findings in relation to the aims of the thesis. The implications of this research for deaf children with SLM, and also for their parents and the professionals that support them are discussed, and recommendations for clinical practice and policy are provided. This chapter also provides an opportunity to reflect on the strengths and limitations of the methodology and offers opportunities for future research.

The data collected for studies 1 and 3 (chapters 4 and 6) are archived on the UK Data Service ReShare (Wright, 2023). In order to protect participant confidentiality, the supporting data for study 2 (chapter 5) cannot be made openly available.

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Chapter 2: Literature Review

This literature review will begin by providing a background on deafness starting with a justification for the terminology used within this thesis. This will be followed by a summary of childhood deafness in the UK (including deaf children with SLM), the terminology used to refer to deaf children who use multiple spoken languages, and the specific population this thesis focuses on. Second, the decision-making process around communication choice for deaf children will be explored together within the concept of family language policy and the wider influences of language on identity and well-being. Third, the role that professionals play in parental decision-making will be examined, with reference to the concept of family-centred care, models of clinical decision-making and the challenge of applying evidence-based practice to advice on SLM. Fourthly, the development of spoken language in deaf children acquiring one or multiple spoken languages, as well as in bilingual hearing children, will be explored with a focus on vocabulary and morphosyntax. Fifthly, the development of executive function (EF) and Theory of Mind (ToM) in deaf children, both those who use spoken and sign language, will be examined as well as how these areas of cognition develop in bilingual hearing populations. Lastly, an outline and rationale of the thesis will be given.

2.1. Deafness

2.1.1. Terminology

To reflect the recent change in recommended terminology, in line with the British Association of Teachers of the Deaf (BATOD), the term “deaf” will be used throughout to refer to deaf individuals with all levels of deafness, and the term “Deaf” will be used to refer specifically to individuals who identify with the Deaf community. The term “hearing impaired” or “hearing impairment”, whilst widely used in deaf education and services that support deaf children, stems from a medical perspective of deafness, and implies that there is a deficit that needs to be corrected and is therefore not used.

2.1.2. Types of deafness

An individual can have a bilateral or unilateral (single-sided) deafness. There are two main types of deafness: sensorineural deafness and conductive deafness. Sensorineural deafness is a permanent type of deafness that occurs when there is damage to the cochlear and/or auditory nerve (Gelfand, 2016). A conductive deafness, on the other hand, which can be temporary or permanent, occurs when sound is unable to pass fully through the outer ear and middle ear, and into the inner ear (Gelfand, 2016). Otitis media with effusion (OME), known commonly as glue ear, is a common cause of temporary conductive deafness especially in pre-school children, where fluid accumulates in the middle ear and prevents the ear drum from moving freely (Tharpe & Seewald, 2017). It is also possible for an individual to have both a sensorineural and conductive deafness, known as a mixed deafness (Gelfand, 2016).

The degree of deafness is categorized according to the decibel (dB) hearing level range: mild (20-40 dB); moderate (41–70 dB); severe (71–95 dB) and profound (95+ dB) (British Society of Audiology (BSA), 2011). An individual’s deafness can also be described in terms of their hearing levels at different frequencies, measured in Hertz (Hz). The same level of deafness may be present at all frequencies or different frequencies may have different hearing levels. There are many causes of deafness, and these can be congenital where an individual is deaf from birth, also known as being prelingually deaf, or acquired where an individual becomes deaf at some point after birth (e.g. at a few months old or in later life), also known as postlingually deaf (Gelfand, 2016). Congenital deafness is most often due to genetic causes despite families often having no family history of deafness (Tharpe & Seewald, 2017). Other congenital causes include ototoxic drugs and infections during pregnancy (e.g.

cytomegalovirus (CMV)) (Gelfand, 2016). Deafness can also be associated with microtia and atresia, specific syndromes and cleft palate/cleft lip and palate (Fligor, 2015). Acquired deafness in early childhood is most often caused by infections (e.g. meningitis) but can also result from cholesteatoma, enlarged vestibular aqueducts or otosclerosis (Tharpe & Seewald, 2017).

2.1.3. Hearing aids and hearing implants

Hearing aids and hearing implants help provide access to sound for deaf children and adults. Hearing aids are programmed to match the individual's deafness and work by amplifying the sounds needed for communication (Fligor, 2015). Hearing implants however, work differently to hearing aids and include four main types: cochlear implants, bone conduction hearing implants, middle ear implants and auditory brainstem implants (ABIs) (Deep et al., 2019; Lassaletta et al., 2019; Reinfeldt et al., 2015; Wong et al., 2019). All of the children who participated in the data collection for this thesis who used a hearing implant had bilateral cochlear implants, one of the most common types of hearing implants. Cochlear implants convert sound waves into electrical signals which are then sent directly to the auditory nerves, bypassing the damaged hair cells in the cochlea, and provide a sensation of hearing (Fligor, 2015).

In the UK, the current National Institute for Health and Care Excellence (NICE) guidelines state that children with a bilateral severe to profound deafness greater than 80dB at two or more frequencies (500 Hz, 1,000 Hz, 2,000 Hz, 3,000 Hz and 4,000 Hz) and who have not received adequate benefit from hearing aids are eligible for cochlear implantation (NICE, 2019). Adequate benefit is defined as making expected progress in speech, language and listening abilities respective to the child's age, cognitive level, and developmental stage (NICE, 2019). The NICE guidelines for paediatric cochlear implantation were relaxed in 2019; prior to this only children with a profound deafness were considered as candidates for cochlear implantation, as well as children who did not make expected progress in spoken language.

2.1.4. Communication options for deaf children

There are a range of communication methods and approaches that parents can choose for their deaf child including spoken and/or signed communication. There are several different approaches to developing spoken language including the Natural Aural approach which uses everyday experiences as opposed to direct teaching, and Auditory Verbal Therapy (AVT) which focuses on supporting listening skills through one-to-one sessions and parent coaching. Signed communication options include British Sign Language (BSL) and Sign Supported English or Signs Supporting English (SSE). BSL is a language in its own right with its own distinct grammar, while SSE supplements spoken words by using the same word order as English but does not convey all parts of the spoken utterance. The term bimodal bilingualism is often used to refer to the use of a signed language and a spoken language. The term "Total Communication" is also used when signed and auditory/oral components are used together.

2.1.5. Childhood deafness in the UK

There are around 52,000 D/deaf children in the UK (Consortium for Research into Deaf Education (CRIDE), 2021), of which about 90% are born to parents with typical hearing (Mitchell & Karchmer, 2004). Of the approximately 52,000 D/deaf children, 26% have a mild deafness, 31% moderate, 9% severe and 12% profound, with 9% of all D/deaf children having at least one cochlear implant (CRIDE, 2021).

Data on the communication mode used at school by deaf children in the UK shows that the majority (88%) use spoken English, Welsh or Gaelic (CRIDE, 2021). Only 2% use British or Irish Sign Language, 7% use spoken language with signed support and 3% use another combination not specified (CRIDE, 2021). These figures may not reflect the languages used by D/deaf children at home. The type of education setting that D/deaf children in the UK attend reflects these findings. Whilst most D/deaf children in the UK (78%) are educated in mainstream schools, only 2% attend specialist schools for the D/deaf and 6% attend mainstream schools with specialist resource provisions (CRIDE, 2021). The remaining 13% attend special schools not specifically for D/deaf children (CRIDE, 2021) and 1% are home educated. 23% of D/deaf children in the UK have an additional special educational need (SEN) (CRIDE, 2021).

13% of deaf children in the UK also use a spoken language other than English or Welsh at home, which corresponds to 6,630 children (CRIDE, 2021). The percentage of deaf children recorded as using multiple spoken languages within each nation are as follows: England - 14%; Scotland – 8%; Wales – 7% and Northern Ireland – 4% (CRIDE, 2021). Within this group of deaf children, in 2021, 219 were registered as being "newly arrived" and had arrived from outside the UK or, if in Northern Ireland, from outside the Republic of Ireland within the last year (CRIDE, 2021).

2.2. Defining Spoken Language Multilingualism (SLM)

In this thesis, the term SLM will be used to refer to children who use more than one spoken language to communicate. Existing research on this population has frequently used the term "bilingual" or "multilingual"; however, the term SLM allows a distinction to be made between deaf children who use one spoken language and one sign language to communicate (bimodal bilingualism), and deaf children who use two or more spoken languages. In the first study (chapter 4), the term "spoken language bilingualism" has been used instead of SLM as the focus was specifically on deaf children who used two spoken languages to communicate, as opposed to two or more. The term "multilingual parents" has been used to refer to parents who themselves use at least one other spoken language at home in addition to the country's majority language.

In the UK, the term "English as an Additional Language (EAL) learners" is widely used particularly in education settings. The Department for Education (2019, p. 9) defines EAL learners as those "exposed to a language at home that is known or believed to be other than English" but "is not a measure of English language proficiency". The term EAL refers to children born in the UK or those who have come to the UK from another country, and includes new arrivals, refugees and asylum seekers, Roma learners, and learners with limited first language literacy skills. Pupils who are identified as EAL learners when they start school at four years old will continue to be recorded as an EAL learner for the whole of their education, therefore, advanced EAL learners also come under this umbrella term.

The term "EAL" has also been adopted by the National Deaf Children's Society (NDCS), the UK's leading charity for deaf children and young people, to refer to deaf "children and young people who have been exposed to any spoken language other than English and who continue to be exposed to this other language in the home or community" (NDCS, 2019, p. 3). In line with the definition put forward by the Department for Education, the NDCS use the term to include both deaf children who have recently arrived in the UK and whose first language is not English, as well as deaf children who were either born or have lived in the UK for a significant period and may be nearly or fully fluent in English but who also speak another language(s) at home (NDCS, 2019).

Similar to the terminology adopted by the NDCS, in this thesis a broad and inclusive approach has been taken when defining SLM. In this thesis, the term SLM is used to include all deaf children who speak or understand two or more spoken languages "…regardless of the level of proficiency, use, and the age at which the languages were learned" (Grech & McLeod, 2012, p.121). The decision was made to focus on deaf children with SLM who were not using a signed language due to the differences in language development, both representation and processing, in spoken bi/multilingualism and bimodal bi/multilingualism (Emmorey et al., 2016; Poarch, 2016).

2.3. The focus of the thesis

Deaf children with SLM form an incredibly diverse group and therefore the specific subset of deaf children with SLM that each study focuses on is clearly stated, and detailed audiological and language profiles are provided. Most of the deaf children with SLM that the current thesis focuses on have a severe to profound sensorineural deafness, diagnosed by six months old and received bilateral cochlear implants by 24 months old. In addition, most of the deaf children who participated in the third study (chapter 6) also attended AVT, a specialist early intervention therapy that focuses on spoken language development (https://www.avuk.org/what-is-auditory-verbal-therapy). The decision was made to mainly focus on deaf children who had been identified as being deaf and received cochlear implants by six and 24 months old respectively to reflect the medical practice that was in place when these children were born and due to the impact that these factors have on language outcomes. Therefore, our findings may not be representative of all deaf children with SLM, or indeed all deaf children with SLM who use cochlear implants.

2.4. Parental decision-making

Parents of deaf children are faced with many complex decisions that they must make on behalf of their child (e.g. communication choice, type of intervention and cochlear implantation). These decisions often have a long-lasting impact on their child’s future and are presented increasingly early in a child’s life due to the introduction of the newborn hearing screening programme and medical advances in hearing technology. As over 90% of deaf children are born to parents with typical hearing with no family history of deafness, parents frequently face these decisions with no knowledge or experience of deafness (Mitchell & Karchmer, 2004). Furthermore, there is often limited definitive long-term evidence-based outcome data to support their decision-making, leading to increased uncertainty.

2.4.1. Decision-making around communication choice

One of the most important and often complex decisions that parents of deaf children must make is whether their child will communicate using spoken and/or sign language. The communication choices that parents make for their child can be described in terms of a family language policy (King et al., 2008), a set of explicit and implicit choices regarding "a particular language use pattern and particular literacy practices within home domains and among family members" (Curdt-Christiansen, 2009, p. 352). For parents of deaf children from hearing families, the family language policies they construct will greatly influence their child's relationship with the Deaf community and their Deaf identity depending on whether they introduce a signed language. For multilingual parents of deaf children, whose home language is not the country's majority language, the issue of family language policy also exists in terms of decisions relating to the maintenance of their home language depending on whether they raise their child with multiple spoken languages.

2.4.2. Family language policy

In the last decade, family language policy has become a field of research in its own right (Fogle & King, 2013) and has provided a framework in which child language development in the family can be explored through the language policies that families actively "construct and enact" (Curdt-Christiansen, 2013b, p. 281; Smith-Christmas, 2016). Interest in how parental management can shape a child's language practice goes back to the early 1900s (e.g. one person one language (OPOL)); however, the concept of family language policy was first formalised as a 3-component model (language ideology, practice, and management) by Spolsky in 2004.

The distinction between the concepts of language practices and management can be difficult to make. Spolsky (2009) differentiates between these two concepts in his model of language policy by defining language management as the changes made by caregivers to language behaviours within the family, and language practices as the language behaviours in everyday life. Whilst not the focus of the studies within this thesis, recent research, however, has acknowledged that parents are not the only family members responsible for language management and its impact on family language practices. Children also play a significant role in shaping the family language policy by either supporting or undermining the choices that their parents make on their behalf. As such, they have the potential to contest the family language policy by acting against their parents' language decisions and, as a result, can also be conceptualized as agents (Fogle & King, 2013; Revis, 2019).

Language ideologies are often influential in guiding the management approaches and practices (Curdt-Christiansen, 2009; King et al., 2008) and as a result play a significant role in language transmission and maintenance (Abdi, 2011). They can be defined as a "set" (Armstrong, 2014, p. 573) of sociocultural perceptions and intentions that an individual holds towards their languages (Curdt-Christiansen, 2013a) and their level of engagement with each one (Moin et al., 2013; Pillai et al., 2014). Language ideologies can be either "individual-or group-held" (The Douglas Fir Group (DFG), 2016, p. 37), and overlap with sociolinguistic factors (Riches & Curdt-Christiansen, 2010) such as personal and social identity (Lanza 2007; Pillai et al., 2014) and cultural practices (Pillai et al., 2014).

Depending on the language status that individuals assign to each language, language ideologies can vary between family members (Hirsch & Lee, 2018). As mentioned, family language policies can be bi-directional, whereby the child's approach to multilingualism can differ from their parents (Fogle & King, 2013; Revis, 2019), and older siblings can influence younger ones (Parada, 2013). This can result in ideological conflicts if family members try to change the ideologies and practices of other family members through the management of the family language policy (Armstrong, 2014). Parents, using the power they hold within the family (Spolsky, 2009), can modify the family language policy through the sociolinguistic decisions they make on behalf of the whole family. Meanwhile, children can shape the family language policy through their language and identity choices (Fogle & King 2013; Revis, 2019). This can result in negotiation among family members (Armstrong, 2014), multiple language policies co-existing within the same family (Curdt-Christiansen, 2015), and modifications to the family language policy occurring over time (Revis, 2019).

The language ideologies that members of a family hold and ultimately the decisions they make regarding their family language policy are also constrained by a complex network of factors at both the micro (family) and macro (societal) level (see Curdt-Christiansen, 2009, p. 355). At the macro level, economic, social, cultural and political factors can be influential, while at the micro level, parents' own education, language experience, knowledge of multilingualism and expectations can play a role. Raising children multilingually is also time consuming and resource intensive, particularly in monolingual societies. For parents of deaf children who wish to raise their deaf child with a signed language such as BSL, the lack of funding and high cost of courses can result in a large economic investment. Furthermore, the huge disparity in access to BSL courses in the UK for parents of deaf children can make it impossible for parents to learn, even if they can afford it. The language choices available to each family will therefore vary and so will the level of agency they have in constructing their family language policy.

Family language policies are important to research as they connect two fields of study: language policy and child language acquisition. The beliefs and ideologies that families hold about language and language use, their language practices and how they shape them to achieve their goals ultimately impact child language outcomes (De Houwer, 1999). The framework that family language policy sets for child-carer interactions plays a key role in a child's developmental trajectory of language acquisition, as well as the maintenance of the home language. It is therefore important to understand how parental ideologies are formed and what factors influence their attitudes and beliefs.

2.4.3. Impact of family language policies on identity, relationships, and well-being for deaf children

Family language policies can also have a significant and lifelong impact on a child's cultural identity and relationships with their family, and consequently their overall well-being (Müller et al., 2020) by influencing the way in "which adults and children define themselves, their family roles, and family life" (King, 2016, pp. 727-728) through language. The advice that professionals provide to parents of deaf children regarding communication choice, including recommendations on using the family's home language(s), therefore has the potential to impact the child in a profound way. Language is symbolic of culture and ethnicity, connecting generations and communities, and as such plays a central role in forming shared identities. Identity development in deaf children is often strongly related to the language(s) they use and can be explored using the Deaf Identity Development Model (Glickman, 1996) that proposes four types of cultural identity in deaf individuals – deaf, hearing, bicultural (deaf and hearing) and marginal (neither deaf nor hearing).

Research exploring how identity in deaf children affects life outcomes, such as psychosocial well-being, has often compared these four types of cultural identity. A study on 742 deaf adults in Denmark found that psychological well-being levels were significantly higher in those who had a deaf, hearing, or bicultural identity compared to those with a marginal identity (Chapman & Dammeyer, 2017). Similarly, Hintermair (2008) found that among 629 deaf individuals aged 14 to 73 years old, levels of self-esteem and life satisfaction were lower in those with a marginal identity than the other three groups, with the bicultural identity group scoring the highest on both measures. Communication proficiency has also been proposed to be crucial in the development of identity among deaf individuals. Goldblat and Most (2018) who examined the relationship between cultural identity and cochlear implantation in 141 deaf adolescents and young adults, reported that those who were not proficient in one mode of communication did not develop a defined cultural identity.

For deaf children from multilingual families, their identity has the potential to be also influenced by their home language and culture. Few research studies have examined identity development in deaf individuals who are from families where another spoken language is used in addition to the country's majority language. However, a study on Māori Deaf adults in New Zealand found that for them, being Deaf and Māori are inseparable parts of themselves, and through identifying with both the Deaf world and their family heritage culture in the hearing world they have formed plural identities (Smiler & Locker McKee, 2007). Access to a shared language within multilingual families has also been found to have a significant impact on a deaf individual's quality of life. A study on 70 deaf South Asian young people in the UK (mean aged 15 years) found that those who did not speak their family's home language and whose family did not use BSL experienced loneliness, cultural isolation, and religious marginalisation (Atkin et al., 2002). It is therefore crucial that parents are supported by professionals to make informed communication choices for their deaf child to enable them to construct family language policies that are in the best interest of their child.

2.4.4. The role of professionals in decision-making around communication choice

Parental decision-making around communication choice for deaf children between spoken and/or sign language has been researched extensively and a wide range of factors have been found to influence the decisions parents make (Ching et al., 2018; Crowe, Fordham, et al., 2014; Crowe, McLeod, et al., 2014). Young (2002) put forward a framework to capture the decision-making experience which explores these factors within three dimensions: information, expectations, and identity. Although limited research, conducted only outside the UK, has focused on parental decision-making for deaf children from the perspective of multilingual parents, Young's (2002) framework can also be applied to existing findings. See chapter 5 for a detailed review of the factors that influence the communication decisions parents of deaf children make, including multilingual parents.

Information is a key component in parental decision-making around communication choice for deaf children, including those whose home language is not the country's majority language (Crowe, Fordham, et al., 2014; Crowe, McLeod, et al., 2014; Decker et al., 2012). While friends, family and other caregivers of deaf children have been reported to be sources of information and to varying extents influential in parental communication choices (Crowe, Fordham, et al., 2014; Crowe, McLeod et al., 2014; Guiberson, 2013; Steinberg et al., 2003), professional advice has been found to be a significant factor for parents of deaf children (Crowe, Fordham, et al., 2014; Crowe, McLeod, et al., 2014; Eleweke & Rodda, 2000; Kluwin & Stewart, 2000). For multilingual parents of deaf children, professional recommendations have also been reported to greatly influence their family language policies, sometimes even resulting in parents deciding not to use their home language despite their desire to (Steinberg et al., 2003).

Once a child is diagnosed as being deaf, parents will encounter a wide range of professionals who work with deaf children in health, education, and social care. Three professional roles that are often greatly involved in the early stages of a deaf child's life are audiologists, Teachers of the Deaf, and speech and language therapists. However, there are also many other types of professionals that parents of deaf children will encounter right from the initial diagnosis to their child's transition into adulthood including but not limited to: Ear Nose and Throat (ENT) consultants; General Practitioners (GPs); health visitors; mainstream teachers and teaching support assistants. The level of involvement that each of these professionals will have in the care of a deaf child will differ and will also vary depending on the individual needs of the child, but they all have the potential to greatly influence the communication choices that parents make.

The international consensus statement on best practice for family-centred early intervention for deaf children (Moeller et al., 2013) highlights the key role professionals play in supporting parents in decision-making related to their child. Family-centred intervention is an approach to planning and delivering paediatric services that emphasises the importance of the family and collaborative family-professional partnerships (The American Academy of Pediatrics, 2012). Family–professional partnerships are formed through effective communication, shared information and respect for each family's preferences, cultural values and aspirations (The American Academy of Pediatrics, 2012). This approach enables professionals to support parents to make an informed choice, defined as a decision "based on relevant knowledge, consistent with the decision-maker's values and behaviourally implemented" (Marteau et al., 2001, p. 100). Consequently, family-centred care results in higher levels of family satisfaction and better outcomes for the child (e.g., Dempsey & Keen, 2008).

2.4.5. Clinical decision-making models

There are several different models of clinical decision-making that professionals can use to share information with families and support them in making an informed choice. Shared decision-making, an evidenced-based approach, is now widely considered as good standard practice (Porter et al., 2018). Through this interactive process, professionals and patients, or their families, work collaboratively and share the responsibility to make decisions based on the best available evidence and the patients'/families' preferences and values (Elwyn et al., 2012). When multiple professionals are involved, interprofessional shared decision-making takes place.

Two alternative models of clinical decision-making are the paternalistic model (clinician-driven) and the informed decision-making model (parent-driven), which fall at either end of the decision-making continuum with shared decision-making in between them. Whilst individuals want to be given information to enable them to take an active role in the decisions that concern them or their family members, they have reported feeling abandoned when the decision was their sole responsibility (Elwyn et al., 2012). This can lead to decisional conflict, a state of uncertainty which arises when patients or their family are unsure which is the best option to choose (Boland et al., 2017). Decisional conflict can result in delayed decisions, decisional regret, and future changes to the decision (Carr et al., 2016; O'Connor et al., 1998) and can occur due to limited knowledge and information, insufficient support and uncertain personal values (Carpenito, 2000). Shared decision-making on the other hand, enables the patient/family to choose the extent to which they are involved (Edwards & Elwyn, 2009) and it has been found to improve patient knowledge and satisfaction, as well as reducing decisional conflict and decisional regret (Boland et al., 2017; Hong et al., 2016).

Shared decision-making also naturally aligns with evidence-based practice, a process that professionals are expected to comply with that requires decisions about healthcare to be guided by professional expertise and the best-available research evidence, whilst also taking into consideration the perspective of the clients and their families (Roulstone, 2011). However, whilst shared decision-making and evidence-based practice can take place simultaneously, when these decisions become more complex, this can become challenging especially with regards to using research evidence to support their clinical advice. Professionals working with multilingual families of deaf children have reported that providing evidence-based advice on SLM is difficult due to limited research on this specific subset of deaf children (Crowe & Guiberson, 2021). Two areas of development that deaf children can have difficulties with are spoken language development and cognitive development, including EF and ToM (Botting et al., 2017; Kronenberger et al., 2014; Schick et al., 2007). Research focusing specifically on these areas in deaf children with SLM is either limited in the case of language development, or non-existent in the case of cognition.

2.5. Spoken language abilities in deaf children with SLM

A review by Crowe (2018) of 22 studies looking at communication outcomes in deaf children using multiple spoken languages, concluded that, based on the current evidence-base, professionals should not discourage parents from considering SLM for their deaf child. However, while there is increasing evidence that deaf children can acquire more than one spoken language, there is still great variability in the reported linguistic outcomes. Furthermore, very few studies have examined language abilities in the child's home language, directly or via parental reports, in addition to the country's majority language. Limited information is also often provided on the children's language background and participant samples are often extremely broad with respect to factors known to impact language development in this population (e.g. age at diagnosis and age at cochlear implantation).

This section of the literature review will discuss spoken language development in deaf children, both those who use one spoken language and those with SLM. Focus will be given to two areas of language development, vocabulary and morphosyntax, as these are the two domains the third study (chapter 6) focussed on. Furthermore, as the majority of the deaf children who participated in the third study used cochlear implants, attention will be given to this specific subgroup of deaf children. Next, the factors that are associated with the variability in linguistic outcomes in deaf children with cochlear implants, including deaf children with SLM, will be considered. Lastly, language development in bilingual hearing children will be discussed with regards to vocabulary and morphosyntax.

2.5.1. Spoken language abilities in deaf children with SLM

Limited research has been conducted on language outcomes in deaf children with SLM; however, focus on this specific population is increasing. A number of studies, many of which examined language abilities in all of the child’s languages, either using standardised or informal assessment, have reported that deaf children with SLM can achieve proficiency in at least two spoken languages (Bunta & Douglas, 2013; Bunta et al., 2016; Guiberson, 2014; Francis & Ho, 2003; McConkey Robbins et al., 2004; Thomas et al., 2008; Waltzman et al., 2003). Bunta and Douglas (2013) examined 20 deaf children with SLM who spoke English and Spanish (mean age = 51.9 months), and 20 monolingual English-speaking deaf children (mean age = 47.3 months) in the United States. The two groups were matched as individual pairs on chronological age, type and duration of device used, and type and duration of intervention. In addition, all the children had received hearing aids/cochlear implants by five years old and participated in an intervention programme following AVT principles. Language abilities in English and Spanish were assessed using the Auditory Comprehension, Expressive Communication and Total Language scores from the Preschool Language Scale, Fourth Edition

(PLS-4) (Zimmerman et al., 2002a, 2002b). No significant difference was found between the deaf children with SLM and the oral monolingual deaf children for any of the three English language measures, and no significant difference between the bilinguals' Spanish total language scores and English scores was observed.

A retrospective study was then conducted by Bunta et al. (2016) to explore what impact providing intervention in both of the child’s languages had on language outcomes and how this compared to children who received intervention only in English. Twenty Spanish-English speaking deaf children were split into two groups of ten children. Group 1 had received English only intervention (mean age = 4;8) and group 2 had received English and Spanish intervention (mean age = 4;7). Group 2 consisted of some of the children included in Bunta and Douglas’ (2013) study. Both groups were closely matched on background variables and socioeconomic status (SES). The study found that the deaf children with SLM who received intervention in both languages (Spanish and English) performed significantly better on the Expressive Communication and Total Language scores than the deaf children with SLM who received intervention only in English. On the other hand, no significant difference was observed between the two groups for the Auditory Comprehension scores. The authors concluded that providing intervention in the home language (Spanish), in addition to English, can result in enhanced English language outcomes.

Several other studies have assessed the child’s home language, in addition to the country’s majority language; however, in contrast to Bunta and Douglas (2013), informal language measures have been typically used. This is often due to the wide range of home languages spoken and the lack of suitable formal assessment measures. One frequently used method of assessing the home language is the Student Oral Language Observation Matrix (SOLOM), a parent-report measure used to assess linguistic communicative competence (Parker et al., 1985). The SOLOM informally assesses five domains of oral language (comprehension, fluency, vocabulary, pronunciation, and grammar) with a score of one to five for each domain and an overall score out of 25.

Guiberson (2014) used the SOLOM to assess first and second language skills in deaf children with SLM compared to deaf children who only used one spoken language in Spain (aged 3 to 18 years old). A range of second languages were spoken by the deaf children with SLM and the majority were exposed to this second language at home and at school. The two groups were comparable in age, type of hearing technology used, degree of deafness and communication mode. The deaf children with SLM had significantly higher total SOLOM scores for Castilian Spanish compared to the monolingual deaf children. Second language scores for the SOLOM for the deaf children with SLM ranged from five to 23 (mean = 10.88) and were not significantly associated with exposure to the second language. This may be because most of the bilingual children were exposed to their second language through school and a parent. Thomas et al. (2008) also used the SOLOM to assess performance in the country's majority language in deaf children with SLM and reported that the deaf children with SLM performed within the expected range for monolingual children when assessed in the country's majority language. In addition, Thomas et al. (2008) found that the deaf children with SLM demonstrated better language skills in the country's majority language compared to their home language.

However, other studies have reported poorer language outcomes in deaf children with SLM compared to oral monolingual deaf children (Deriaz et al., 2014; Forli et al., 2018; Keilmann et al., 2019; Teschendorf et al., 2011). Keilmann et al. (2019) conducted a prospective study on 43 deaf children with SLM and 52 oral monolingual German-speaking deaf children aged 3;0 to 10;11, as well as 30 bilingual hearing children aged 3;4 to 7;4. All the deaf children used hearing aids or cochlear implants and had received AVT. Assessment was only conducted in German and not in the deaf children with SLM's home language. The study found that deaf children with SLM scored significantly lower than monolingual deaf children for receptive grammar and expressive vocabulary in German and both groups scored lower compared with the normative hearing sample.

An earlier study, conducted in Germany, also reported that deaf children with SLM achieved lower scores compared to monolingual deaf children for receptive and expressive language abilities (Teschendorf et al., 2011). Teschendorf et al. (2011) conducted a retrospective case review of 52 deaf children with SLM (mean age at implantation = 36.5 months) and 41 oral monolingual deaf children (mean age at implantation = 39.6 months). The monolingual deaf children performed better on all language tests compared to the deaf children with SLM, and with regards to home language abilities, assessed using the SOLOM, the majority fell in the early phases with 29 children scoring between five and 11. The authors noted though that almost all of the deaf children with SLM gave German as their dominant language and whilst some of the children used their home language actively, most only used single words and expressions.

Similar findings have also been observed in Italy. Forli et al. (2018) compared 14 deaf children with SLM to 14 monolingual deaf children, matched on age at diagnosis and age at which hearing aids and cochlear implants were received. Receptive and expressive lexical abilities were assessed, as well as morphosyntactic comprehension. The SOLOM was also used to assess home communicative competence in both Italian and, for the deaf children with SLM, the home language. The study found that deaf children with SLM scored significantly lower compared to monolingual deaf children on the SOLOM, as well as lower (although not statistically significant) on structured language assessments of lexical production and morphosyntactic comprehension. However, the deaf children with SLM performed better than the monolingual group on the formal assessment of lexical comprehension.

Researchers have attributed the variation in language outcomes for deaf children with SLM to several factors. Similar to deaf monolingual children, these include positive associations with the quantity and quality of the exposure to each language (Teschendorf et al., 2011; Waltzman et al., 2003; Yim, 2012) and duration of implantation (Yim, 2012). Secondly, lower levels of parental proficiency in the country's majority language and poorer social integration of the family (Forli et al., 2018; Teschendorf et al., 2011), have also been associated with reduced language abilities in deaf children with SLM. Thirdly, as previously discussed, whether intervention is delivered in one or both languages has been reported to impact language performance, such that intervention provided in both languages results in better language outcomes (Bunta et al., 2016).

2.5.2. Spoken language abilities in oral monolingual deaf children

Language outcomes in deaf children acquiring only one spoken language have been researched much more extensively and their performance is typically compared to hearing monolingual children. Whilst comparison with hearing children does not take into account the impact of their deafness, they do help to identify if deaf children require additional support with spoken language development. For the purposes of this review, as most of the children who participated in the studies within this thesis used cochlear implants, the focus will be on this specific subgroup of deaf children. While age-appropriate spoken language levels in lexical, syntactic, and morphological skills are now attainable for deaf children with bilateral cochlear implants (Dettman et al. 2016; Duchesne et al. 2009; Leigh et al. 2013), significant within-group variation also still exists (e.g., van Wieringen & Wouters 2015). Despite early implantation, children with cochlear implants can still perform below their age matched peers (Duchesne et al. 2009; Guo & Spencer, 2017; Lund, 2016) and the variation observed, even in deaf children who were implanted early, is also often greater than in typically developing hearing children of the same age (Wie et al., 2020). Difficulties in all domains of spoken language can be present (Dettman et al. 2016; Ruben 2018; van Wieringen & Wouters, 2015; Yoshinaga-Itano et al., 2018) but two areas that research on deaf children with cochlear implants has often focused on, and which will be the focus of this review, are vocabulary and morphosyntax.

Some deaf children acquiring spoken language demonstrate differences in vocabulary breadth and depth, as well as in word learning skills, when compared to hearing children. A meta-analysis by Lund (2016) found that, compared to hearing children, deaf children with cochlear implants demonstrated lower receptive and expressive vocabulary knowledge. Results found a mean difference across studies of -20 standard score points for receptive vocabulary and -11 standard score points for expressive vocabulary (Lund, 2016). Several studies have also demonstrated reduced word learning abilities in this population (Lund & Schuele, 2017; Walker & McGregor, 2013).

Although deaf children are being implanted at an increasingly younger age, often at around 12 months old, this still results in spoken language acquisition starting at a later cognitive developmental point compared to hearing children. As cognitive abilities underlie vocabulary acquisition and many deaf children with cochlear implants have non-verbal cognitive abilities within the expected range of their typically developing hearing peers (Geers et al., 2003), this later start may serve as an advantage. Indeed, vocabulary growth in the first year after cochlear implant activation has been found to be rapid (Ertmer & Inniger, 2009; Fagan, 2015; Majorano, et al., 2020), and in some cases, much greater than in typically developing hearing children (Fagan, 2015; Kosaner et al., 2013). For deaf children to “catch-up”, their rate of vocabulary acquisition needs to continue to progress at a faster rate than that observed in typically developing hearing children; however, this fast expansion has been reported to decrease after the first year post cochlear implant activation (Kosaner et al., 2013).

Research findings are mixed in terms of whether children with cochlear implants can "catch-up" and there is great variability in reported vocabulary outcomes for this population.

For some deaf children with cochlear implants, this period of fast expansion can lead to receptive and expressive vocabulary skills in line with their typically developing hearing peers (Geers et al., 2016; Leigh et al., 2013; Wie, 2010; Wie et al., 2020). Several studies have reported that early implantation is a key factor in achieving age-appropriate vocabulary profiles. A retrospective study was conducted by Leigh et al. (2013) on 35 deaf children implanted between six and 12 months old and 85 deaf children implanted between 13 and 24 months old. The study found that children who were implanted by 12 months old achieved age-appropriate receptive vocabulary scores three years post implantation. Their rate of language growth was also comparable to what would be expected in hearing children their age. However, the children who were implanted between 13 and 24 months old demonstrated a significant language delay at three years post implantation. Similar findings were reported in a prospective cohort study by Colletti et al. (2011) on three groups of deaf children implanted at age two to 11 months (n=19), 12-23 months (n=21), and 24-35 months (n=33). Deaf children implanted between two and 11 months old had receptive vocabulary progress very similar to hearing children, and significantly better than the deaf children implanted between 12-23 months and 24-35 months.

However, other studies have reported a vocabulary gap persisting, or closing but then reappearing, between children with cochlear implants and their hearing peers (Davidson et al., 2014; Nittrouer et al., 2018; Välimaa et al., 2018; Wie et al., 2020). A recent retrospective cross-sectional study was conducted in Norway on 88 children (mean age = 8.7 years) who had received bilateral cochlear implants before three years of age (Busch et al., 2022). The deaf children were compared to two groups of hearing children, one group matched for hearing age, gender, and maternal education, and the other group matched for chronological age, gender, and maternal education. Results found that children with cochlear implants had a significantly smaller receptive vocabulary compared with children of the same chronological age; however, no significant difference was observed when comparisons were made with the group matched for hearing age (Busch et al., 2022).

Likewise, Wie et al. (2020) conducted a longitudinal study on 21 Norwegian deaf children who received cochlear implants between five and 18 months of age. The children's language abilities were assessed at 10 time points during their first six years after implantation. During the first four years, the receptive and expressive vocabulary gap between children with cochlear implants and hearing children initially closed; however, it then later reappeared. At 48 months post implantation no significant differences between the two groups were observed but between 48- and 72-months post implantation, while expressive vocabulary scores remained age-appropriate for the deaf children, their receptive vocabulary skills fell increasingly behind the hearing group. At six years post implantation, the deaf children's receptive vocabulary abilities were approximately one standard deviation below normative means for hearing children. Similarly, Werfel (2017) and Werfel et al. (2022) reported that whilst rate of vocabulary growth for deaf preschool children, including those who used cochlear implants, was similar to their hearing peers, they were unable to "catch-up".

A second domain of language that has been extensively investigated in oral monolingual deaf children with cochlear implants is morphosyntax. Whilst some studies have reported achievement of age-appropriate abilities, including when matched for vocabulary size, (Jung & Ertmer, 2018), many others have demonstrated that grammatical development is particularly challenging for this population (Guo et al., 2013; Guo & Spencer, 2017; Nittrouer et al., 2014). The morphosyntactic difficulties observed in deaf children with cochlear implants are similar to those seen in children with developmental language disorder (DLD) (Benassi et al., 2021). In English these grammatical form difficulties, often omissions and substitutions, include obligatory verb markers (past tense -ed, 3rd singular -s and conjugated forms of the copula be), past tense markers (-ed) and grammatical markers on nouns (plural -s and possessive -s) (Guo et al., 2013; Guo & Spencer, 2017; Nittrouer et al., 2014).

Impaired morphosyntactic development is argued to result from the period of auditory deprivation that deaf children experience before they receive hearing amplification, as well as their continued reduced access to sound (Moeller et al., 2010). A significant amount of morphosyntactic information in English, such as contracted forms of BE, possessive -s and third person singular, are high frequency word final sounds which are perceptually difficult for deaf children. Indeed, English speaking children with cochlear implants who have better speech-perception abilities have been found to produce grammatical morphemes with greater accuracy compared to English speaking children with cochlear implants who have weaker speech-perception abilities (Guo et al., 2013). English morphemes are typically acoustically insalient, they are short in duration and often unstressed and monosyllabic (Duchesne, 2016). Therefore, they can be hard for deaf children with poor speech-perception skills to distinguish. Some research has found that deaf children with cochlear implants, who therefore have better access to high frequency sounds, demonstrate better morphosyntactic abilities compared to deaf children with the same degree of deafness who use hearing aids (Stelmachowicz et al., 2004). However, as is observed for vocabulary, findings on grammatical abilities are conflicting with large variation in reported outcomes, including evidence of deaf children performing comparably to hearing children. In addition, as assessments used to assess morphosyntax often tap into skills beyond just grammatical morpheme use it can be difficult to assess if speech-perception skills are solely responsible (Guo & Spencer, 2017).

A systematic review by Hallé and Duchesne (2015) analysed 18 studies on morphosyntactic skills in a number of different languages in deaf children who had received their cochlear implants by 36 months old. The study confirmed weaker abilities in the different languages for morphology, with errors frequently being omissions and substitutions of agreement markers for gender and number of determiners, verb endings and clitic pronouns. Many studies have reported similar findings. Nittrouer et al. (2014) analysed language samples from 21 deaf children with cochlear implants (mean age = 82 months) and 19 hearing children (mean age = 80 months). The deaf children were found to produce language samples containing shorter utterances, as well as fewer conjunctions, personal pronouns and bound morphemes compared to the hearing group. Another study on 125 deaf children who were implanted by three years old (length of cochlear implant experience ranged from 1;0 to 5;4), evaluated receptive and expressive grammatical abilities using the Clinical Evaluation of Language Fundamentals-Preschool (CELF-Preschool) (Wiig et al., 1992, 2004) (Geers et al., 2009). Forty percent of the children fell within the expected range for the Sentence Structure Subtest (receptive grammatical skills), while 29% and 33% fell in the expected range for the Recalling Sentences and Word Structure Subtest respectively (expressive grammatical skills).

Similarly, a longitudinal study on grammatical accuracy in English-speaking deaf children with cochlear implants also reported lower overall performance, although great variation was observed (Guo & Spencer, 2017). Ten children who were implanted by 30 months old were assessed at three-, four- and five-years post implantation and compared to 10 hearing children at three, four and five years old (matched hearing age). The children all completed a story-retell task and percent grammatical communication units (PGCU) were calculated. Although significant improvement was observed over the three years for the deaf children, at four- and five-years post implantation, their PGCU was lower than the hearing children. However, 30-50% of the deaf children did produce PGCU comparable to the hearing children and the type of grammatical errors the two groups made were similar. Many other studies have also highlighted the large variation in morphosyntactic abilities of deaf children with cochlear implants. Ramirez Inscoe et al. (2009) used the South Tyneside Assessment of

Syntactic Structures (STASS) (Armstrong and Ainley, 1983) with 45 deaf children three years after implantation (mean age at implantation = 27 months). At three years after implantation (age range = 4-6 years old), 58% of the deaf children demonstrated expressive spoken grammar skills equivalent to or better than three-year-old hearing children.

Furthermore, other studies have reported that age appropriate morphosyntactic skills are achievable for deaf children. For example, some deaf children with cochlear implants have shown no difficulties with pronouns and plural regular forms in English (Boons et al., 2013) and, when compared to hearing age-matched children, mean length of utterances in Italian (Caselli et al., 2012). In a recent study, Jung and Ertmer (2018) assessed 13 deaf children with cochlear implants at 24 months post activation (mean chronological age = 44.62 months) and 13 hearing children (mean age = 20.69 months), matched on vocabulary size. Grammatical abilities assessed using the MacArthur Communicative Development Inventory (Fenson et al., 2007) and language samples were comparable between the two groups on all four measures: (a) grammatical complexity, (b) mean length of utterances, (c) tense marker total, and (d) productivity scores. Similarly, Werfel et al. (2022) evaluated verb tense marking in 30 deaf children (16 children used at least one cochlear implant; mean age at implantation = 21.5 months) and 31 hearing children every six months from four to six years old. The Test of Early Grammatical Impairment (TEGI) (Rice & Wexler, 2001) was used to assess the children's use of past tense and the third person singular. Results found that, whilst the deaf children made gains over the years, their performance was consistently lower than the hearing children. At age four, the difference between the two groups was nearly two standard deviations; however, by six years old the difference was only just over half a standard deviation and therefore the deaf children had caught up.

The large variability in lexical and morphosyntactic abilities in deaf children with cochlear implants is associated with many different factors (see Duchesne & Marschark, 2019 for a review), but it has not yet been determined which best predict linguistic outcomes (Marschark, Duchesne et al., 2019). Age at which deafness is diagnosed, age at cochlear implantation, and duration of cochlear implant use have all been found to contribute to language outcomes (Cuda et al., 2014; Duchesne & Marschark, 2019; Szagun & Schramm, 2016). However, other studies, including Lund's (2016) meta-analysis on vocabulary abilities in deaf children, did not find an effect for age of cochlear implantation nor length of use. Other child-related factors that have been shown to play an important role include the age at which deaf children enrol in intervention programmes (Yoshinaga-Itano, 2003), presence of additional disabilities (Meinzen-Derr et al., 2011), cognitive abilities (Wenrich et al. 2019) and educational setting (Busch et al. 2020). In addition to child-related factors, environmental factors including parental engagement and responsiveness (Nicastri et al., 2021) have also been reported to impact language outcomes in this population. However, these factors do not explain all the variation and some researchers have proposed that the significant and persistent linguistic difficulties that some deaf children with cochlear implants present with may be a result of co-occurring language disorders (de Hoog et al., 2016; Hansson et al., 2018).

2.5.3. Spoken language development in bilingual hearing children

Within-group variation for language outcomes, including vocabulary and morphosyntax, is not limited to deaf children; typically developing hearing children acquiring multiple spoken languages also demonstrate a high level of variability. Research on this population includes studies focusing on hearing children acquiring two, three or more than three spoken languages. However, this section will focus on language development in bilingual hearing children as most of the children with SLM that the studies in this thesis focused on used two spoken languages. Additionally, this sub-group of multilingual hearing children has received the most attention in research on this population.

Bilingualism is increasingly being considered as a continuum as opposed to a bilingual-monolingual dichotomous category (Luk, 2015), with age of acquisition, length of exposure and current and cumulative amount of input and output used to construct individual profiles (Serratrice, 2018). A distinction is also made between simultaneous bilinguals (Bilingual First Language Acquisition), who are exposed to two languages from birth, and sequential bilinguals who are exposed to a second language after they have started to learn their first. However, the cut-off between simultaneous bilingualism and sequential bilingualism is disputed, with thresholds between one month and four years proposed (see Genesee & Nicoladis, 2009).

Lexical acquisition in bilingual hearing children follows a developmental sequence in each language similar to that observed in monolingual children in terms of the mechanisms involved and the rate and pattern of word learning (Döpke, 2000). Criterion-referenced expressive and receptive single word vocabulary assessments, standardised on monolingual children, are typically used to assess lexical abilities. Bilingual hearing children are often reported to perform less well compared to their monolingual hearing peers on these standardised vocabulary tests when assessed in one language (Bialystok et al., 2010; Hemsley et al., 2010; Hoff & Core 2013). However, this form of assessment does not take into account that a bilingual child's vocabulary knowledge is distributed across two languages (Oller et al., 2007; Sheng et al., 2012). Alternative measures which take into account bilinguals' vocabularies across their two languages have been proposed: total vocabulary (total number of words known including translation equivalents) and total conceptual vocabulary (the number of words known not including translation equivalents). When vocabulary scores from each language are combined, bilingual hearing children are found to have a total conceptual vocabulary size similar to that of monolingual hearing children (Bedore et al., 2005; Peña et al., 2015). The use of total conceptual vocabulary scores therefore demonstrates that bilingualism does not reduce a child's overall rate of vocabulary development, as the "vocabulary gap" should disappear (Hoff et al., 2012). However, Gonzalez-Barrero et al. (2020) found that whilst total vocabulary resulted in significantly larger vocabularies for bilingual children compared to monolinguals, total conceptual vocabulary led to smaller vocabularies for bilingual children compared to monolinguals. Consequently, Gonzalez-Barrero et al. (2020) proposed a new metric, the bilingual adjusted vocabulary, that counts translation equivalents differently depending on the child's age and results in similar vocabulary sizes to monolinguals.

Morphosyntactic development in bilingual hearing children is often argued to occur at the same rate as monolingual hearing children (see Genesee & Nicoladis, 2009, for a review); however, studies report mixed results. Some studies have found that bilingual hearing children acquire structures in their second language in line with their monolingual hearing peers (Parra et al., 2011), whilst other studies report that bilingual hearing children perform not as well compared to monolingual hearing children both in infancy (Hoff et al., 2012), and in early (Thordardottir & Brandeker, 2013) and later (Komeili & Marshall, 2013) childhood. Morphosyntactic abilities in the bilingual child's first language are also reported to be poorer and often attributed to limited language exposure (Gathercole & Thomas, 2009) and the influence of the dominant language (Gathercole & Thomas, 2009).

Cross-linguistic influence has been observed for vocabulary and morphosyntax (see review in Nicoladis, 2016). Evidence of cross-linguistic influence is only observed occasionally in bilingual children; usually language is processed as expected for the language and cross-linguistic influence is not considered a sign of language confusion, but an integral part of a bilingual's language representation and use (Nicoladis, 2006; van Dijk et al., 2022). Moreover, it is likely the outcome of shared, or tightly connected, syntactic structures (Serratrice, 2022). In the case of cross-linguistic influence for morphosyntax, several studies report that the direction of this influence occurs more often from the dominant language to the weaker language (e.g., Argyri & Sorace, 2007; Genesee & Nicoladis, 2009; Yip & Matthews, 2000).

Bilingual children are almost always dominant in one language as a result of dividing their time between each language and not spending equal amounts of time hearing and using them. This dominance is often not static; with sufficient exposure to the second language a shift in dominance from the first to second language can occur. Exposure is therefore a strong predictor of proficiency, perhaps more so than age of acquisition (Bedore et al., 2012; Hammer et al., 2012; Hoff et al., 2012). The relationship between language exposure and rate of language acquisition in each language is difficult to determine though, in part because research rarely documents language input in detail, instead often just reporting which language a child uses in different environments (e,g, at school or home). Furthermore, the information gathering process is extremely disparate in the field (Kašćelan et al., 2022).

While exposure plays a key role in proficiency, it is not the only predictor. The nature of the input a child receives is also a significant factor (see review in Unsworth, 2016), influenced by the number of native speakers (Fernald et al., 2006) and different sources of input (Jia & Fuse, 2007) a child has access to. Other child-external factors, as opposed to child-internal factors such as age of acquisition, that can influence proficiency include sensitivity to the majority language of the community (Paradis & Nicoladis, 2007), language of the media (Dixon, 2011), and the child's parents' attitudes (Cha, & Goldenberg, 2015). The linguistic distance (differences) between the languages that a multilingual child speaks has also been found to influence performance in the home language(s), with phonological similarity related to expressive vocabulary abilities and word order typology and morphological complexity associated with receptive vocabulary abilities (Floccia et al., 2018).

Overall, research on language outcomes in vocabulary and morphosyntax for all three groups of children (deaf children with SLM; deaf oral monolingual children; hearing multilingual children) are highly variable. Age-appropriate spoken language abilities for deaf children with cochlear implants are achievable; however, difficulties in all domains of language are frequently reported. Research on deaf children with SLM is also inconclusive; whilst some studies have demonstrated that deaf children can acquire multiple spoken languages at a comparable level to deaf children who use one spoken language, others have reported weaker abilities. In addition, the methods used to assess multilingual deaf and hearing children do not always take into account the child's abilities in both languages, with the child's home language being rarely assessed. This gives an incomplete profile of the child's full linguistic abilities. Furthermore, as Swanwick (2017) argues, this approach creates a paradigm within which success is considered with regards only to the child's performance in the country's majority language.

2.6. Cognitive abilities in deaf children with SLM

No research has been conducted yet on cognitive abilities in deaf children with SLM, despite the fact that difficulties in this area of development including EF and ToM, are well documented in deaf children who use one spoken language. In this section, both areas of cognition will be discussed with reference to both literature on oral monolingual deaf children and bilingual hearing children.

2.6.1. Executive function (EF)

EF is an umbrella term that represents a complex set of neurocognitive processes that emerge in early infancy and continue to develop into adolescence (Buttelmann & Karbach, 2017). There is some debate over the specific components of EF (Anderson, 2002); however, it is generally agreed that working memory, inhibitory control and cognitive flexibility are the three core EF processes (Miyake et al., 2000; Zelazo, 2015). These three cognitive processes underlie other EF skills including: planning; organization and attention. EF and its associated components coordinate and control internal and external thoughts, behaviours and emotions, and are crucial for facilitating goal-orientated and situation-orientated actions (Barkley, 2012; Blair, 2016). Strong associations have been found between EF and school readiness and academic achievement (e.g., Shaul & Schwartz, 2014), as well as SES, criminal outcomes and physical health in adulthood (Moffit et al., 2011).

2.6.1.1. Executive function (EF) in oral monolingual deaf children

Deaf children from hearing families who communicate using spoken language or are late signers have frequently been reported to be at risk of reduced or clinically significant impairments in EF, particularly in working memory and inhibition (Botting et al., 2017; Hintermair, 2013; Jones et al., 2019; Kronenberger et al., 2014). Meanwhile, Deaf children who are native signers (whose parents are deaf and use sign language as their main form of communication) have been found to develop EF abilities in line with their typically developing hearing peers (Goodwin et al., 2021; Hall et al., 2018). The exact cause of the EF difficulties observed in oral and late signing deaf children is still debated (Botting et al., 2017; Figueras et al., 2008; Hall et al., 2017; Jones et al., 2019; Kronenberger & Pisoni, 2020; Morgan & Dye, 2020). Two accounts have been proposed to explain why deaf children are at risk: the auditory access account, and the language access account.

The auditory access account argues that EF difficulties exist as a direct result of deafness, where auditory deprivation is responsible (Kronenberger & Pisoni, 2020). Absent or degraded auditory input is argued to have the potential to result in significant EF impairments and consequently it is impacted by factors such as age of onset of deafness and duration of lack of auditory input. Deaf children with severe to profound deafness, without access to hearing technology (e.g. cochlear implants), would therefore be expected to display reduced or clinically significant impairments in EF. Evidence in support of the auditory access account comes from studies that have reported EF impairments in deaf children who use spoken language and who experienced a period of reduced auditory input before receiving cochlear implants. However, the children in these studies have experienced both a period of auditory deprivation and language deprivation, and the impact of these factors on EF development are intertwined (e.g. Hall, 2020).

The alternative account put forward to explain why deaf children are at risk of EF difficulties, the language access account, argues that no direct effect of hearing deprivation exists that cannot be accounted for by language deprivation. Research that supports the language access account has demonstrated that Deaf children who are native signers, who experience a period of auditory deprivation but not language deprivation, do not present with EF impairments (Goodwin et al., 2021; Hall et al., 2018; Marshall et al., 2015). Therefore, it is argued that language access in any modality, spoken or signed, is more important than auditory access for the development of EF.

EF can be assessed using an experimental approach or behaviour rating inventories completed by parents, teachers, or the child themselves. Experimental tasks involve presenting children with new problems that they would not encounter in normal life and therefore cannot use automatic processes to solve them. Many studies that have used experimental approaches to assess EF performance in deaf children have reported impaired development (Figueras et al., 2008). However, the ecological validity of these assessment measures has been questioned as it is difficult to determine whether the differences observed under these experimental conditions translate to real-world situations (Burgess et al., 2006). Behaviour rating inventories on the other hand are designed to capture a child's EF skills within a real-world context during daily activities as opposed to artificial experiments. Although there are limitations to parent-reports used to measure child behaviours (Toplak et al., 2013; Friedman & Gustavson, 2022), in comparison to experimental tasks, they provide a more ecologically valid profile of EF abilities in day-to-day life (Barkley, 2012). The Behaviour Rating Inventory of Executive Function (BRIEF) (Gioia et al., 2000) has been widely used with deaf children, both those who use (one) spoken and/or signed language to communicate. An overall Global Executive Composite (GEC) score is produced that consists of two indexes: The Behavioural Regulation Index (BRI) and the Metacognition Index (MI). The BRI and MI are in turn calculated from eight subscales. Higher scores point to more difficulties with that cognitive skill(s).

Beer et al. (2011) used the BRIEF with 45 deaf children who used cochlear implants (37 spoken language only and 8 total communication). Reported scores for the subscales inhibition and working memory, as well as the BR index were all significantly higher than normative means. Additionally, the percentage of deaf children falling in the elevated range varied from 13-31% compared to the expected 16%. Similarly, Hintermair (2013) found that deaf children (89% used spoken language only and 11% used spoken and signed) were at increased risk of EF problems compared to hearing norms. However, deaf children who attended mainstream schools were at significantly increased risk of EF problems in fewer domains compared to deaf children attending Schools for the Deaf. These group differences were suggested to be due to child differences (e.g. severity of deafness), as opposed to a direct result of the type of school attended. Kronenberger et al. (2014) also found that deaf children aged seven to 17 years old who used cochlear implants and attended/had attended intervention promoting spoken language had increased risk of clinically significant EF scores on the BRIEF compared to the hearing control group. However, no significant differences were reported between the preschool deaf and hearing groups.

On the other hand, Hall et al. (2017) found that Deaf native signing children did not have significantly increased rates of either elevated or clinically significant scores compared to the normative sample. Compared to the hearing control group they were at greater risk of elevated (but not clinically significant) scores for the inhibition and working memory subscales; however, this was attributed to unexpectedly good scores in the hearing control group. In 2018, Hall et al. conducted a second study including deaf oral children who used cochlear implants to provide an additional comparison of deaf children who had experienced a period with limited language input before implantation. No evidence of EF difficulties was observed in the Deaf native signers compared to normative scores and on many EF skills they performed significantly better than the deaf oral children. However, on the working memory and inhibition subscales, statistically significant differences were observed compared to the hearing control children.

Similarly, Goodwin et al. (2021) tested three groups of deaf children: early exposure to American Sign Language (ASL); later exposure to ASL and later exposure to English, as well as a group of hearing children (early exposure to English). None of the three groups of deaf children were significantly more likely than the hearing children to have clinically significant scores. Additionally, no significant difference was found between deaf children with early exposure to ASL and hearing children with early exposure to English. Age of language exposure was found to be a significant predictor (except for inhibition or emotional control) but age of auditory exposure was not. Consequently, like Hall et al. (2017; 2018), Goodwin et al.'s (2021) study supports the language access account as opposed to the auditory access account.

It is well established that EF and language are highly associated (Kuhn et al., 2014; Kuhn et al., 2016); however, the direction of this relationship is less well determined. Some theories argue that language mediates EF, such as Zelazo et al.'s cognitive complexity and control theory (Zelazo et al., 2003), while others argue that EF mediates language (e.g., Baddeley, 2003; Pellicano, 2010). Additionally, some studies have reported that the relationship is bidirectional (e.g., Slot & von Suchodoletz, 2018). Research on children with developmental disorders, who have reduced EF, has attempted to identify the direction of the relationship between EF and language development. However, due to the cognitive difficulties that are often present in these populations, drawing conclusions on whether language mediates EF, or the other way round, is challenging (Bishop et al., 2014). Deaf children on the other hand, offer a unique context in which the relationship between EF and language can be explored, as the majority of deaf children have cognitive abilities within the normal range despite delayed language abilities (Marschark & Hauser, 2008). However, findings have been mixed; some studies have reported that language skills mediate EF (Botting et al., 2017; Jones et al., 2019), while other studies have found that EF mediates language abilities (Kronenberger et al., 2020).

2.6.1.2. Executive function in bilingual hearing children

No research has been conducted on EF in deaf children with SLM; however, this cognitive area has been extensively studied in typically developing bilingual hearing children. Some have argued that bilingual individuals have an advantage compared to monolingual individuals in EF due to knowing and using two languages. Research has suggested that in bilingual individuals both languages are jointly activated even when only one language is used (Thierry & Wu, 2007; van Heuven et al., 2008). This joint activation results in a conflict between the two languages (van Heuven et al., 2008), placing a greater demand on the speaker’s cognitive processing (Bialystok, 2017). In order for bilinguals to attend to one language, without interference from the other one, and switch between them effortlessly, it has been proposed that EF works intensely as an effective selection system (Hilchey & Klein, 2011). This hypothesised mechanism, based on neuroplasticity, is agued to lead to a bilingual advantage in EF over monolinguals (Christoffels et al., 2013; Kroll & Chiarello, 2016; Wiseheart et al., 2016). However, Gunnerud et al. (2020) argue that the theory of neuroplasticity and proposed argument that bilingualism impacts EF as a whole is too simplistic and general. While there is little agreement over the specific mechanisms that result in a bilingual advantage in EF, attention and inhibitory control are often proposed as being the underlying cause (Bialystok, 2017). These two components of EF are argued to be enhanced due to language coactivation which demands the constant inhibition of one language, whilst giving attention to the other.

However, the benefits of bilingualism on EF, including the size and existence of a bilingual advantage, are highly debated (Dick et al., 2019; Paap et al., 2015; Sanchez-Azanza et al., 2017). Whilst many studies have reported a bilingual advantage (e.g. Adesope et al., 2010), others have not (e.g. de Bruin et al., 2015), despite having similar methodologies. The literature on bilingualism and EF specifically in children is limited and evidence of a bilingual advantage in this population is even more inconsistent than in adults (Valian, 2015). Several factors related to bilingualism have been found to impact EF performance, including language dominance (Weber et al., 2015), proficiency (Rosselli et al., 2015) and language exposure (Brito et al., 2015). Additional factors are also associated with more advanced EF development such as SES (Ardila et al., 2005), musical training, physical exercise, and immigrant status (Valian, 2015). The extent to which these factors impact EF performance is not known, but a bilingual advantage is likely to be small in comparison (De Cat et al., 2018).

A recent meta-analysis and systematic review conducted by Gunnerud et al. (2020) investigated whether a bilingual advantage exists in EF, in children aged 0 to 18 years. Several different components of EF were examined including inhibition, attention, switching, monitoring, working memory, and planning. The study concluded that, due to the small mean effect size and small-study effects, there was minimal support for an EF advantage in bilinguals. Gunnerud et al. (2020) determined that their findings were in line with Paap et al. (2015) who concluded that “bilingual advantages in executive functioning either do not exist or are restricted to very specific and undetermined circumstances" (p. 265). As such there is currently no consensus as to whether an advantage in EF exists and/or under which conditions.

2.6.2. Theory of Mind (ToM)

The second area of cognition that this thesis focuses on in deaf children with SLM is ToM. ToM is essential for successful social interaction and communication, by enabling individuals to understand the mental states of others (e.g. beliefs, desires and intentions) and realise that they can be different from their own (Premack & Woodruff, 1978; Wellman et al., 2001). As such, ToM understanding predicts the social skills needed for successful interaction with peers (Peterson et al., 2016). Assessment of ToM has often focussed on false belief tasks (Baron-Cohen et al., 1985; Perner & Wimmer, 1985) which assess an individual's ability to understand that the beliefs held by others can be different to their own (Wellman et al., 2001). The individual must then correctly predict the behaviour of the individual who holds the false belief that they do not share. Typically developing hearing children have been found to follow a consistent developmental trajectory in ToM performance, with most children passing these tasks between five and six years old (Wellman et al., 2001). However, ToM is no longer considered a unitary construct but is instead understood to be a multidimensional construct, including both the cognitive (thoughts) and affective (feelings) domains relating to oneself and others (Westby and Robinson 2014).

2.6.2.1. Theory of Mind (ToM) in oral monolingual deaf children

No research has previously been conducted on ToM development in deaf children with SLM; however, deaf children from hearing families are consistently reported to be at risk of delays in the acquisition of this cognitive skill (Peterson, 2002, Peterson, 2004; Peterson & Siegal, 2000; Schick et al., 2007), with these difficulties appearing to persist into adulthood

(Marschark, Edwards et al., 2019). Moeller and Schick (2006) assessed ToM skills of 22 deaf children (mean age= 6.9) who communicated using sign and spoken English compared with 26 hearing children (mean age = 5.0). The deaf children, on average, mastered the tasks at an older age than the hearing children. While none of the deaf children aged four to six years old successfully completed the false belief task, 70% of the seven- to nine-year-old deaf children did. Moeller and Schick (2006) suggest that deaf children demonstrate a delay but not necessarily a deficit in ToM development. A more recent study by Jones et al. (2015) measured ToM performance in 27 deaf children (mean age = 9;0) Most of the children used SSE to communicate and two used BSL (none were native signers). Two control groups were included: 23 hearing children matched for chronological age, gender and non-verbal ability (mean age = 8;8) and 23 younger hearing children (mean age 5;2). All the children completed a battery of first- and second-order false belief tasks, pre-recorded by a native signer in BSL, SSE and spoken English. The group of deaf children performed comparably to the younger hearing children. In comparison to the age-matched control group, no significant difference was observed for the unexpected-location task; however, on the unexpected-content and second-order belief task, the deaf children scored significantly lower.

On the other hand, other studies have reported similar performance between oral monolingual deaf and hearing children. Remmel and Peters (2009) assessed ToM development in 30 children with cochlear implants (mean age = 7.5), who all used spoken English as their primary mode of communication. All the children were assessed on a range of ToM and language measures, with the deaf children demonstrating little to no delay compared to the hearing control group (although the mean age of the hearing children was two years below the deaf children). However, in a recent study Choi and Jeong (2023) compared ToM performance between 50 oral monolingual deaf children (mean age = 99.1 months), implanted by 36 months old, and 50 hearing children matched on age and gender. The deaf children who achieved age-appropriate receptive language skills had similar ToM abilities to the hearing children; however, they scored lower on advanced ToM tasks such as second-order false belief.

Deaf children who are native signers, however, are consistently found to perform significantly better on ToM tasks than deaf children from hearing families, and as well as their typically developing hearing peers (e.g., Courtin, 2000, Courtin & Melot, 2005; Schick et al., 2007). Similar to EF, the contrast in ToM performance between deaf children from hearing families and Deaf children who are native signers is attributed to differences in their linguistic environment. While Deaf children who are native signers experience a linguistically rich environment from birth, deaf children from hearing families typically encounter insufficient language exposure either through non-native signing or reduced spoken language input. These differences in the child's linguistic environment have an impact on ToM development in relation to both the child's own language abilities and the caregiver's mental state talk they receive.

Peterson and Siegal (1995; 2000) originally proposed "the conversational hypothesis", arguing that deaf children from hearing families exhibit ToM delays due to their limited access to mental state discourse. This theory is supported by longitudinal research on typically developing hearing children which has shown that ToM skills are promoted by a child's exposure to immersive mentalistic conversational experiences at home from an early age (Jenkins et al., 2003; Ruffman et al., 2002). ToM abilities in deaf children from hearing families are also predicted by maternal mental state talk (Moeller & Schick, 2006). Deaf children from hearing families are often exposed to less "mentalistic" conversation (including sharing thoughts and feelings) (Morgan et al., 2014) which can have an impact on their (receptive and productive) knowledge of both the vocabulary (e.g. "believe" or "know") and syntax (e.g. sentential complements) required to discuss mental states.

There is also evidence that a deaf child's own language abilities are related to their ToM performance. Language skills have been acknowledged as a predictor of ToM abilities (for a meta-analysis see Milligan et al., 2007) and despite early cochlear implantation, spoken language development can still be delayed compared to hearing children (Duchesne & Marschark, 2019). Engagement in mind-related conversation can therefore still be limited and the risk of ToM difficulties remains. It is still debated as to whether mastering ToM requires only general language skills (semantic and grammatical) or sentential complements involving mental state verbs (de Villiers, 2005; Schick et al., 2007; Slade & Ruffman, 2005). If it is the latter, oral deaf children may be at a heightened level of risk of delays in ToM. While a meta-analysis by Lund (2016) concluded that vocabulary skills (receptive and expressive) are lower in children with cochlear implants compared to hearing children, grammatical abilities have been found to be impacted to a greater extent (Geers et al., 2009).

In typically developing hearing children, research has focussed on the role that EF and language proficiency play in the development of ToM, with many studies confirming the relationship between EF and ToM (for a meta-analysis see Devine & Hughes, 2014) and language and ToM (for a meta-analysis see Milligan et al., 2007). However, the relative contributions of EF and language on ToM performance are not known. With regards to the relationship between language proficiency and ToM, both longitudinal (de Villiers & Pyers, 2002; Farrant et al., 2012) and language training studies (Hale & Tager-Flusberg, 2003; Lohmann & Tomasello, 2003) provide evidence of a strong directional relationship whereby language abilities predict ToM performance, but not the other way round. Thus, children with stronger language skills typically perform better on ToM tasks.

The role of EF in ToM development is also strongly supported, in particular inhibition, shifting and working memory (see Perner and Lang, 1999, for a review). ToM development has been framed in terms of the competence vs performance debate. The competence perspective argues that ToM is acquired at around four years old when a child can use their environment and experiences to understand that their mental state may differ to others (e.g. Perner & Roessler, 2012). The performance perspective, on the other hand, argues that a child's ToM understanding is reached at around four years old, as a result of their EF skills being sufficiently developed (e.g. Baillargeon et al., 2010; Carlson & Moses, 2001). Many studies have found a positive relationship between EF and ToM in preschool children (Müller et al., 2012) and in older children (Austin et al., 2014). The nature of the relationship between EF and ToM is debated but most researchers argue that EF is a pre-requisite for ToM (e.g. Carlson et al., 2002; Hughes & Ensor, 2007), with inhibition and working memory often thought to play a key role (Carlson et al., 2002).

2.6.2.2. ToM in bilingual hearing children

Whilst no research has been conducted on ToM abilities in deaf children with SLM, research suggests that bilingual hearing children have enhanced ToM performance compared to age-matched monolingual hearing children (for a meta-analysis see Schroeder, 2018). An increasing number of studies have reported stronger performance on ToM abilities (Javor, 2016; Kovács, 2009), although, like EF, studies showing similar ToM performance to monolingual children and only showing an advantage when language skills are controlled for also exist (Dahlgren et al., 2017; Díaz & Farrar, 2018a; Nguyen & Astington, 2014).

The proposed bilingual advantage in ToM has traditionally been attributed to enhanced EF, in particular inhibitory control, which enables children to inhibit their own belief or knowledge in order to focus on someone else's (Carlson et al., 2002). As acknowledged earlier, many studies have argued that bilinguals confer an advantage in EF inhibitory control abilities, achieved through the constant need to inhibit one language, while using the other (Bialystok & Viswanathan, 2009). This bilingual advantage in inhibitory control is claimed to result in enhanced ToM performance. However, as previously discussed, not all studies on bilinguals report an enhanced performance in EF, including in inhibitory control, and thus arguments of a bilingual advantage are contentious (e.g. Dick et al., 2019; Paap et al., 2015; Sanchez-Azanza et al., 2017). Indeed, several studies have found that EF predicts ToM abilities in monolingual children but not in bilinguals (Buac & Kaushanskaya, 2020; Diaz & Farrar, 2018ab). As a result, the EF account for a bilingual advantage is plausible, but evidence in support of this hypothesis is often inconsistent and not in favour. Consequently, some researchers argue that other factors lead to enhanced ToM abilities.

Two alternative explanations to account for a bilingual advantage in ToM have been put forward, namely the "metalinguistic awareness" account (Goetz, 2003; Diaz and Farrar, 2018b), and the "socio-pragmatic" account (Goetz, 2003; Fan et al., 2015). These accounts claim that the psycholinguistic demands that bilingual children experience drives their enhanced ToM performance. Metalinguistic awareness is the understanding that the cognitive representation of a speaker's communicative intent may not be the same as the real world. Bilingual children have the metalinguistic understanding from early on that the same concept can have two labels (i.e. one in each language). The "metalinguistic awareness" account proposes that bilinguals enhanced metalinguistic skills may facilitate ToM, i.e. the understanding that the mental states of others (e.g. beliefs, desires and intentions) can be different from one's own. The "socio-pragmatic" account derives from the fact that bilingual children frequently encounter individuals with differing linguistic knowledge and as such understand that some people speak one of their languages and some people speak both. This increased awareness that two people can have different language knowledge, and the ability to match the language they use to that person, is argued to transfer to the understanding that two people can have different mental states. Díaz (2021) goes further to explain that bilingual children also demonstrate enhanced abilities to identify and repair breakdowns in communication (Wermelinger et al., 2017) and thus also possess increased perspective taking skills (Liberman et al., 2017).

To conclude, the literature on a bilingual advantage in ToM is mixed and the underlying mechanism for a bilingual advantage in ToM is not agreed upon. The argument that enhanced EF performance is a result of the specific psycholinguistic demands bilinguals encounter appears to be more plausible than the EF account. For deaf children acquiring one spoken language, the evidence base strongly suggests that they are at risk of reduced or clinically significant impairments in both EF and ToM. It is not known if speaking multiple languages may act as a protective factor in the development of ToM, and potentially EF, in deaf children with SLM but, given that they will also experience complex linguistic environments, it seems possible.

Even with the limited existing evidence on spoken language development in deaf children with SLM and cognitive development in deaf children more generally, it may not always be possible to relate it to the child at the centre of the decision-making. Deaf children with SLM form an extremely heterogenous population and therefore there are likely to be instances where the child differs greatly from those children that the evidence-based recommendations were formed on (e.g. their language background or if they have additional disabilities). Therefore, there may be occasions where the outcome of a shared decision-making process cannot be made on the current evidence base. In these situations, decisions will need to be made by focussing more on the other two components of evidence-based practice, professional expertise and the perspective of the child’s family including their beliefs, values, and goals.

2.7. Summary and future directions

In summary, this chapter has shown the complexity of the decision-making process around communication choice for deaf children and the key role that professionals play in supporting parents to reach these decisions. The family language policies that families of deaf children construct have a significant and long-lasting impact on both the child's language and cognitive outcomes, but also on their cultural identity, relationships, and well-being. For multilingual parents of deaf children, the additional decision regarding whether to use their home language in addition to the country's majority language and/or sign language further complicates the decision-making process.

For professionals to support multilingual parents of deaf children to make informed communication choices they must engage in evidence-based practice by sharing the research whilst also taking into consideration the parents' preferences, cultural values, and aspirations. Limited research with inconclusive findings on language and cognitive outcomes in deaf children with SLM therefore presents a challenge. It is also imperative that research explores the decision-making process regarding SLM for deaf children from both the parents' and professionals' perspective.

2.8. Outline of the thesis

This review has identified several gaps in the literature. First, no studies to date have explored the beliefs of professionals in the UK on SLM in deaf children and what advice they provide to parents. Although a few studies have been conducted on professionals outside the UK, these have used small sample sizes and furthermore professional beliefs (beliefs informed by clinical experience, training and the evidence-base) are likely to vary between countries and change over time. Additionally, no existing research has differentiated between different professional roles and identified whether their beliefs and consequently the parental advice they provide are consistent or not. Second, the decision-making process around SLM for deaf children from the parents' perspective has also received very limited attention and has not been explored within the UK. It is crucial that professionals understand what factors influence parents' decisions to raise their deaf children with multiple spoken languages for them to be able to support parents through shared decision-making. Third, the current evidence-base on language outcomes for deaf children who use multiple spoken languages is inconclusive and existing studies frequently only examine the country's majority language (not the child's home language). Additionally, studies have often included heterogenous samples in terms of age of diagnosis, type/degree of deafness and age at cochlear implantation, as well as providing limited information on the children's language background and language environment (i.e. language exposure and use). No research has been conducted on cognitive abilities in deaf children with SLM despite the fact deaf children can be at risk of difficulties. These translate into three specific research questions, each one forming the basis of one of the three studies presented in this thesis.

2.8.1. Research Questions

Research Question 1: What beliefs do professionals have on SLM in deaf children and what advice do they give to parents?

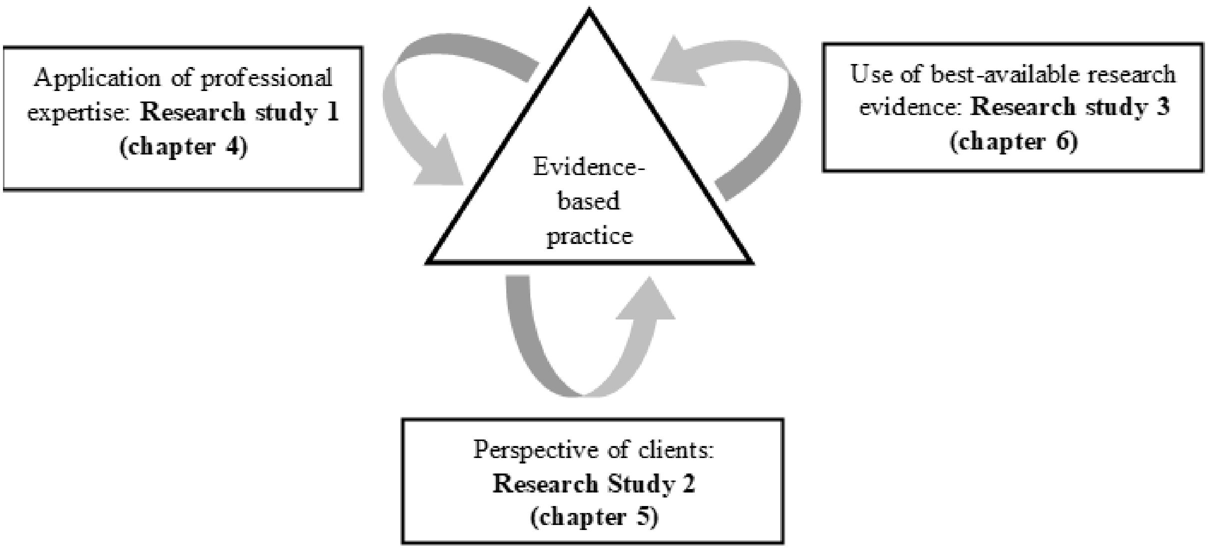
Research Question 2: What factors influence the decisions multilingual parents of deaf children make on whether to raise their child with multiple spoken languages?

Research Question 3: What are the language (vocabulary and morphosyntax) and cognitive (executive function and Theory of Mind) abilities of deaf children with SLM?

2.8.2. Research studies

This thesis is structured around the evidence-based practice framework (Figure 1) and each study focusses on one of the evidence-based practice components: (1) application of professional expertise, (2) the perspective of the clients (i.e. deaf children with SLM and their families), and (3) use of the best-available research evidence (Roulstone, 2011).

Figure 1: Mapping of studies onto evidence-based practice framework



The first two studies explore the decision-making process around SLM for deaf children. The first study (chapter 4) examines this from the professionals' perspective, specifically Teachers of the Deaf, speech and language therapists and audiologists. Due to the heterogeneity of deaf children, this study focused on children who use two spoken languages, diagnosed by six months old with a bilateral severe-to-profound sensorineural deafness, and who received bilateral cochlear implants by 24 months old. Professional beliefs on whether deaf children can achieve spoken language bilingualism and what factors impact this were explored, as well as potential outcomes of raising a deaf child with two spoken languages. In addition, this study investigated whether professionals believe they have a role in the decision-making process that parents experience when deciding whether to raise their deaf child with two spoken languages, and what advice they give to parents. By differentiating between three different professional roles that parents of deaf children encounter soon after their child's diagnosis, it was possible to identify whether their beliefs and consequently the parental advice they provide are consistent or not.

The second study (chapter 5) reports the decision-making process around SLM from the parents' perspective. In particular, it explores the complexity behind family language policies for multilingual parents of deaf children and what factors influence their decisions on whether to raise their deaf child with multiple spoken languages. A qualitative approach using one-to-one interviews allowed an in-depth investigation to be conducted. This study also provides a unique comparison of the decision-making process between multilingual parents of deaf children and multilingual parents of hearing children who chose SLM for their child.

The final study (chapter 6) directly examined the language and cognitive abilities of five deaf children with SLM. Three other groups of children were included as comparison groups: oral monolingual deaf children, monolingual hearing children and multilingual hearing children. The children's expressive vocabulary and morphosyntactic abilities in English were tested, and the multilingual deaf and hearing children's home language(s) was also informally assessed. Cognitive abilities focused specifically on EF and ToM.

Together, the findings from all three studies presented in this thesis aim to support professionals in their role within the decision-making process around communication choice for deaf children from multilingual families. By targeting the three components of evidence-based practice, this research will enable professionals to work in accordance with the international consensus statement on best practices in family-centred intervention for deaf children and support parents to make informed decisions on SLM. Implications for practice and policy, and target areas for future research will be represented within each study and in chapter 7.

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Chapter 3: Methodology

This chapter provides an overview of the methodology for each of the three studies and the rationale behind each one. In addition, the impact that COVID-19 had on the research and the adaptations that were made will be briefly explained.

3.1. Study 1: Deaf children with spoken language bilingualism: Professional guidance to parents

The first study titled "Deaf children with spoken language bilingualism: Professional guidance to parents" (chapter 4) was an observational study. It involved an online survey, made available on the onlinesurveys.ac.uk platform, to obtain quantitative data through yes/no questions, multiple choice questions and Likert 4-point Rating Scales (Appendix 1). The survey was made up of three main sections. The first section explored the participants' professional beliefs about a deaf child's ability to acquire two spoken languages and what factors impact this. The second section then investigated what advice the participants give to multilingual parents who are considering raising their deaf children with two spoken languages. Lastly, the third section collected demographic information relevant to the participants and their work. To establish content validity of the questionnaire and ensure the questions were clear and appropriate, a pilot survey was completed by four speech and language therapists, one audiologist and one Teacher of the Deaf who worked with deaf children. Data collected from the pilot study were not included in the analysis and adjustments were made accordingly before the survey was launched. This methodology allowed the exploration of professional opinions and practices from a large sample of professionals working across the UK. As the first UK-based study to investigate the beliefs UK professionals hold on SLM in deaf children and what advice they give to parents, this approach was deemed appropriate in facilitating a scoping study. The collection of quantitative data allowed the modelling of the predictive role of the professionals' background variables (e.g., type of professional role and previous training on SLM) on their responses.

Alternatively, a qualitative approach could have been taken using focus groups or one-to-one interviews. This would have had the potential to provide richer and more in-depth data on the participants' positionings, experiences and practices (Braun & Clarke, 2013). However, this methodological approach was not chosen due to the high cost in terms of time for the participants and the fact it would yield a smaller sample. An online survey was therefore chosen as it would enable the study to reach and explore the views and practices of a larger and more diverse range of professionals. This was decided to be the most appropriate approach given that the topic had not yet been explored.

Due to the heterogeneity of deaf children in terms of their audiological profile, the survey questions that targeted the professionals' beliefs on SLM focused on a specific sub-set of deaf children. Participants were asked to answer these questions with reference to a deaf child (with hearing parents) who has a bilateral severe-to-profound sensorineural deafness (diagnosed before six months old) and who received bilateral cochlear implants by the age of two. The decision was made to focus on deaf children with a specific audiological profile due to the impact that factors such as age of diagnosis and degree of deafness can have on language development. This profile was also chosen to reflect the participant group of the third study (chapter 6). In addition, there is a large evidence base on monolingual spoken language development after cochlear implantation; however, a limited number of studies have investigated the acquisition of multiple spoken languages in deaf children who use cochlear implants. Therefore, the focus was specifically on professionals' beliefs regarding this sub-group of deaf children with reference to SLM.

The participants for this study included speech and language therapists, audiologists and Teachers of the Deaf. These three professional roles were chosen as they are involved in the care of a deaf child soon after their initial diagnosis (National Deaf Children's Society (NDCS), n.d.-a, n.d.-b). Therefore, multilingual parents of deaf children are likely to encounter these professionals during the period of time they are deciding how to communicate with their child. A number of other professional roles could have been included such as health visitors, nursery teachers and General Practitioners (GPs). However, speech and language therapists, audiologists and Teachers of the Deaf were chosen as these professional roles involve directly supporting the child with regards to their deafness and are likely to have an ongoing relationship with the child's parents (British Academy of Audiology (BAA), 2022; British Association of Teachers of Deaf Children and Young People, 2022; Royal College of Speech and Language Therapists (RCSLT), n.d.).

3.2. Study 2: Spoken language multilingualism in deaf children: Parental decision-making

The second study titled "Spoken language multilingualism in deaf children: Parental decision-making" (chapter 5) collected qualitative data through semi-structured one-to-one interviews which were then analysed using reflexive thematic analysis (Braun & Clarke, 2019a). One-to-one interviews were chosen for this study to gain an in-depth insight into the views, beliefs and experiences of parents who had chosen SLM for their deaf child. There are three main categories of interviews: structured interviews, unstructured interviews, and semi-structured interviews (Babbie, 2007). Semi-structured interviews were chosen to allow a more flexible approach to the interview process. A topic guide of open-ended questions was used flexibly (Appendix 2), allowing variations in both the order and wording of the questions. In addition, the style of interview allowed unexpected relevant responses to be explored further (Patton,

2002) and clarifications to be made by the interviewer (Lune & Berg, 2017). Structured interviews on the other hand, do not allow divergence from explicit questions that are given in the same order to each interviewee, while unstructured interviews do not have a specific framework for questioning. Semi-structured one-to-one interviews were chosen as they facilitated an in-depth and comprehensive approach, whilst ensuring key information relating to the research questions was gathered. Due to the Covid-19 pandemic, the interviews were conducted online which facilitated access to a geographically dispersed population. The interviews were recorded to allow verbatim transcripts to be produced.

An alternative option that was considered was to use a qualitative online survey. This method would have provided a "wide-angle" lens on the topic (Toerien & Wilkinson, 2004, p. 70) by having the opportunity to capture rich data from a larger and more diverse range of perspectives and experiences (Braun et al., 2017). This wide scope approach is especially useful if perspectives from different groups within a wider population are being sought and when researching an un- or under-explored area (Braun et al., 2021). However, qualitative data are not measured in terms of quantity or frequency. The aim of qualitative data, and therefore this second study, is not to generate a sample that achieves statistical representativeness but instead gain rich insights into the chosen topic. Furthermore, whilst the size of the participant dataset needs to be large enough to identify pattens across the data, the aim is not to reach data saturation. Braun and Clarke (2019b) explain that the concept of data saturation is neither very useful nor theoretically coherent with regards to reflexive thematic analysis, the qualitative analysis tool chosen for this study. Instead, it is more consistent with other types of thematic analysis such as codebook or coding reliability which are discussed in more detail later.

Reflexive thematic analysis was chosen to analyse the qualitative data as it can provide a rich and detailed account of the data with regards to people's experiences, whilst also being flexible (Braun & Clarke, 2006; Braun & Clarke, 2019a). Thematic analysis is not a singular method, it includes a range of qualitative research methods that generate, analyse, and interpret patterns of meaning (themes) across a dataset to answer a research question. These different approaches to thematic analysis can be categorised into three main groups: reflexive thematic analysis, coding reliability thematic analysis, and codebook thematic analysis (Braun et al., n.d.).

Coding reliability approaches emphasise the importance of accuracy and reliability in the coding of the data by using multiple coders and a structured codebook. In addition, themes represent “domain summaries”, or “summaries of what participants said in relation to a particular topic or data collection question” (Braun et al., n.d., p. 5). Reflexive thematic analysis on the other hand, highlights the active role of the researcher’s interpretative analysis of the data in identifying patterns/themes. Therefore, codebooks are not used, and themes should not be described as “emerging” or being “discovered” as this depicts a passive process. Furthermore, the idea of “accurate” or “reliable” coding is discouraged as another researcher would not be expected to generate the same codes/themes. Codebook thematic analysis falls in between coding reliability thematic analysis and reflexive thematic analysis. Like coding reliability approaches, a structured codebook is used, and themes comprise of domain summaries; however, more in line with reflexive thematic analysis, codebook approaches acknowledge the interpretive nature of coding data (Braun et al., n.d.).

Reflexive thematic analysis is theoretically flexible and can be approached in several different ways within a wide range of theoretical and epistemological frameworks. It is important that researchers clearly state the theoretical assumptions of their thematic analysis and explain why they are suitable for the study’s research questions. These approaches to thematic analysis are conceptualised as a series of continua as opposed to being fixed or exclusionary oppositions: essentialist versus constructionist epistemologies; inductive versus deductive orientation to data, and semantic versus latent coding of the data.

A constructionist data-driven inductive approach was chosen whereby the generation of codes and themes are led by the content of the data, as opposed to a deductive approach where existing concepts/ideas direct the development of codes and themes. An inductive approach was considered more appropriate for the present study as the topic is an under-researched area and therefore, being led by pre-existing theories and analytic preconceptions was not appropriate. Latent codes/themes were used to help present a more constructionist account of the assumptions underpinning parental experiences around decision-making regarding SLM for deaf children and the factors that influence their choices.

The six-stage method by Braun and Clarke (2006) was used to ensure the analysis was completed in a theoretically and methodologically sound manner. This approach to coding and theme development in thematic analysis is systematic and thorough, however, as it does not use a coding frame or codebook, the process is flexible and iterative. A detailed description of the data analysis process is given in chapter 5; it is important to clearly set out how the data were analysed to allow comparisons to be made to other studies (Attride-Stirling, 2001). The analysis was conducted by one researcher (EW) independently in line with Braun and Clarke's (2019a) argument that as the process of data coding is reflexive and subjective, there is not one "correct" way to code the data and as such multiple interpretations are possible. Therefore, the use of multiple coders and inter-rater reliability are not recommended for reflexive thematic analysis. However, as was the case for the present study, discussion about the codes and themes with other members of the research team to consider alternative interpretations of the data can take place. The aim of this collaboration is not to ensure the data is analysed accurately or to reach consensus; instead, this practice is considered to strengthen the extent to which there is reflexive engagement with the data and to achieve deeper interpretations of meaning (Braun & Clarke, 2019a). For example, in the present study this process involved renaming the first theme which was originally called "being a good parent", following feedback on how the term “good parent” may lead to negative connotations for parents who did not raise their child multilingually. Collaborative reflection and discussion resulted in the theme being renamed as “additional benefits for the child” which framed it more in terms of the parents’ desire to speak their home language to provide these additional benefits, whilst still encompassing all three sub-themes. It is also important for researchers to consider their own position, biases, and prior assumptions. In the present study, all the authors engaged in this practice; this included considering their own experiences working with and/or conducting research into deaf and/or multilingual children.

Researcher positionality is commonly discussed within qualitative research where it is acknowledged that the researcher’s position influences the whole research process, from conception to the interpretation of the findings (Holmes, 2020). However, researcher positionality is also increasingly being considered within quantitative and mixed-methods research (Walker et al., 2013). The term ‘positionality’ is used to refer to the position that a researcher holds within a specific research project and includes identity characteristics (e.g. age, gender, disability status etc.), relationship to the topic/participants being researched (insider and/or outsider status), life experiences (present and past employment/volunteering experiences) and ontological and epistemological beliefs (Savin-Baden & Major, 2013). A researcher’s positionality is typically ascertained by locating the researcher with reference to three areas: (1) the research topic being investigated, (2) the participants being studied, and (3) the research context and process (Savin-Baden & Major, 2013).

Reflexivity is required to enable the researcher to identify their positionality and consider how their position may influence all stages of the research process (Holmes, 2020). As such reflexivity contextualises the research and thus improves its rigour and credibility. Whilst engagement in reflexivity reduces bias, the aim is not to remove the effect of one’s position on the research as social research can rarely be value-free. Instead, the aim is to acknowledge and understand the influence it has. Furthermore, as a researcher's positionality is not fixed, reflexivity is a continual process that must be revisited throughout the research journey. Here I will present my positionality statement and reflect on how my values have changed during the course of the PhD.

I position myself as a White British, monolingual English-speaking female in my late twenties. With regards to the insider/outsider debate, in line with the viewpoint that, instead of being a dichotomy, it is a continuum along which a researcher moves fluidly (Arber, 2006; Holmes, 2020), I consider myself as both an outsider and insider with regards to the present research. I am not multilingual or deaf myself, and I do not have any children, deaf nor hearing, monolingual nor multilingual. Therefore in that respect I am an outsider. However, as a qualified Speech and Language Therapist who has worked and volunteered with monolingual and multilingual deaf and hearing children, I consider myself to be somewhat part of the community that the first study focusses on (chapter 4). Consequently, I would argue that overall I am an 'in-betweener' researcher, a new concept that some researchers have put forward to reflect researchers who don't identify as fully insiders or outsiders (Chhabra, 2020; Milligan, 2016). Furthermore, my position on this continuum has shifted during the PhD, both depending on the topic and participants (e.g. when speaking with parents as opposed to professionals) and depending on time (e.g. as the PhD progressed and I stopped clinical work).

My clinical and voluntary experience, as well as my university education, have guided the choice of my research topic and research questions. I chose to frame the PhD project around the evidence-based practice framework with the aim of helping professionals support multilingual parents of deaf children to make informed decisions around language choice. My insider positionality gave me an understanding of the challenges professionals face when supporting parents of deaf children through their decision-making and the importance of providing evidence-based advice. Through my research I was aware of the limited evidence base on language and cognitive outcomes for deaf children with SLM, and on the factors that influence the communication choices that multilingual parents of deaf children make for their child. Therefore, my insider knowledge, enabled me to recognise the need for further research on this specific population with the aim to facilitate professionals to engage in successful shared decision-making around SLM for deaf children. My clinical background also informed the study designs I chose to use, including my qualitative interview topic guide and interview technique (chapter 5) and using an online survey instead of focus groups/one-to-one interviews (chapter 4) to reduce the cost in terms of time for professionals and increase accessibility.

My academic background has also shaped my PhD research, in particular through my ontological and epistemological beliefs. As my research methods training in both my undergraduate and master's degree was solely focused on quantitative methods, I came to the PhD with a more realist approach with a relatively stronger belief that reality can be uncovered in an accurate and objective manner. However, as I learnt about qualitative research methods in preparation for the second study (chapter 5), my ontological beliefs moved towards subtle realism, the idea that an external reality exists but that representations of reality and reality itself are not the same. This shift towards idealism/relativism was driven by an acknowledgement that qualitative research cannot be value-free and that as a result reflexivity is crucial. Consequently, my epistemological perspective has also changed during the PhD, moving from a more positivist position to a more contextual belief, whereby the context contingent nature of data and the importance of interpretation are emphasised.

In the reporting of the results for this study a coding system was not used to indicate the number of participants who made a particular point as this would not be in line with a reflexive thematic analysis approach. As previously discussed, the aim of qualitative research is not to achieve statistical representativeness to generalise the findings to the wider population. As such, it is not appropriate to quantify qualitative data. Firstly, the importance and value of a point made is not necessarily determined by frequency i.e., how many people said it (Pyett, 2003). Secondly, due to the nature of qualitative research, interviewed participants will not all discuss the same issues in response to the same questions (in contrast to a quantitative survey where participants select from a pre-determined set of options). As a result, it cannot be assumed that just because a participant did not raise a particular point, they did not experience it/think it.

3.3. Study 3: Language, theory of mind, and executive function skills in deaf children with spoken language multilingualism

The third study "Language, theory of mind, and executive function skills in deaf children with spoken language multilingualism" (chapter 6) directly examined the language and cognitive abilities of five deaf children with SLM compared to five deaf oral monolingual children, five hearing multilingual children and five hearing monolingual children. English language abilities in expressive vocabulary and morphosyntax were tested, and the multilingual deaf and hearing children's home language(s) was also assessed using parental reports. Cognitive abilities focused specifically on executive function (EF) and Theory of Mind (ToM). A key factor in the decisions behind the assessments used was their suitability for online delivery due to the impact of the Covid-19 pandemic.

3.3.1. Impact of Covid-19 and rationale for remote assessment

The Covid-19 pandemic undoubtably had an impact on the research, most notably affecting data collection and consequently data analysis of the third study. Originally, data collection for the third study was planned to take place face-to-face with the children in their schools. However, due to the sudden closures of schools and travel restrictions, as well as the likely threat of future peaks and further lockdowns, it was decided that the study should be conducted online. Remote assessment offered the best opportunity to enable data collection to take place in a consistent format and minimise the effect of further disruptions related to COVID-19.

Several logistical challenges were encountered including how to deliver the assessments online, record the sessions and manage data protection and safeguarding issues. Recruitment and data collection were therefore delayed while the methodology was revised, and new ethical approval was sought. The sudden announcement of the third lockdown and the news that schools would be closed on a longer-term basis further impacted recruitment and data collection for the third study. Parents of primary school-aged pupils were expected to engage in a much more demanding timetable of classes at home with their child to support their learning, and many parents were also working from home and/or had other children to care for. Recruitment was largely unsuccessful during this period and the decision was made to delay further recruitment until primary schools re-opened fully. As a result, recruitment and data collection took much longer than initially expected and the number of children that participated was much lower than had been hoped for.

3.3.2. Recruitment of deaf children with SLM

Although the decision to conduct data collection online for the third study meant that children could be recruited from across the whole of the UK, recruitment of deaf children with SLM still proved to be very challenging. Very few organisations in the UK that support deaf children collect data on the spoken languages that are used at home and those that do were unable to share this information as they were transitioning to new patient databases. As a result, it was not possible to use information on the geographical spread of deaf children with SLM to inform the recruitment strategy.

The main method of recruitment of the deaf children was via national charities, organisations, and schools for deaf children. In total the following number of settings were contacted: 157 schools with specialist units for deaf children; 2 Schools for the Deaf (the only 2 in the UK which exclusively use an oral approach to education); 93 local National Deaf Children's Society (NDCS) support groups and 8 UK charities and organisations which support deaf children (including Auditory Verbal UK (AVUK); NDCS; The Elizabeth Foundation; Ewing Foundation; Cochlear Implanted Children's Support Group (CICS) and Deaf Education Through Listening and Talking (DELTA)). The National Sensory Impairment Partnership (NatSip) was also contacted, and they kindly forwarded on the project details to their heads of sensory impairment services in the UK of which there are approximately 200 members. The recruitment process from initial contact until the final correspondence lasted from July 2020 until August 2022. Despite this capillary and protracted approach to recruitment, the sample size of deaf children with SLM that met the recruitment criteria was still very small.

3.3.3. Assessments

As previously mentioned, the assessments chosen had to be suitable for online delivery. The children completed the assessments individually via video calls in their home across three sessions. The screen share function in Microsoft Teams and Zoom was used to share the test items and children were given control of the mouse to indicate their responses to non-verbal tasks.

3.3.4. Language assessments

Two domains of language were assessed in English: expressive vocabulary and morphosyntax. These two areas of language were chosen as deaf children acquiring spoken language are frequently reported to have difficulties in them, but they have been only minimally studied in deaf children acquiring multiple spoken languages (see Chapter 2). Home language performance was assessed indirectly via parental questionnaires due to the range of languages spoken (Dutch, French, German, Greek, Italian, Romanian, Russian, and Tamil).

To assess expressive vocabulary the Expressive One Word Picture Vocabulary Test 4th Edition (EOWPVT-4) (Martin & Brownell, 2011) was used. This particularly assessment was chosen as it had been used before with deaf oral children (e.g., Jones et al., 2019). To allow comparisons to be made with previous studies, the same modifications to the assessment (i.e., removal and replacement of certain pictures) were carried out as done by Jones et al. (2019) to ensure the assessment was appropriate for children in the UK. Two substitutions were made; the picture of a racoon was replaced with a badger and the existing picture of a windmill was replaced with another picture of a windmill more representative of those seen in the U.K. The noun "prescription" was also excluded and if the child went past this point in the test, the point was awarded. Additionally, the words "post" and "spanner" were accepted for the target words "mail" and "wrench" respectively. The EOWPVT-4 was also chosen because it is an American assessment and as such it is not routinely used by clinicians or Teachers of the Deaf; therefore, the chance that the child had completed the assessment before was low. The nature of the vocabulary assessment also made it easy to deliver online.

To assess expressive morphosyntax the LITMUS Sentence Repetition Task (LITMUS-SRep task) (Marinis & Armon-Lotem, 2015) was used. Sentence repetition tasks require an individual to listen to sentences and repeat them verbatim, allowing the examiner to assess whether they have acquired the specific structures that the sentences elicit. The abilities that sentence repetition tasks measure are not fully understood (Riches, 2012). Whilst the tasks do tap into working memory, they are argued to not be a measure of a separate component of memory (the "episodic buffer") (Klem et al., 2015). Instead, it has been proposed that they assess an "underlying unitary language construct", requiring the individual to use a variety of language processing skills, in particular their syntactic representations (Klem et al., 2015, p.

146). This form of assessment is widely used to assess morphosyntactic abilities in children and has been demonstrated to be a very good psycholinguistic marker of language impairments, with high sensitivity and specificity (Conti-Ramsden et al., 2001). As a result, they are often included in clinical diagnostic test batteries such as the Clinical Evaluation of Language Fundamentals-5 (CELF-5) (Wiig et al., 2013).

The LITMUS-SRep task has been developed in a wide range of languages as part of the COST Action IS0804 "Language Impairment in a Multilingual Society". The English version comprises 30 sentences in English, with differing levels of grammatical complexity. Five sentence types are included: subject-verb-object (SVO) with auxiliaries/modals; passives; who, what, which object questions; sentential adjuncts and object relative clauses. The LITMUS-SRep task was designed to run on a computer within a PowerPoint presentation where a bear goes on a journey to a cave to look for treasure. This format made it ideal for online delivery for the present study. The sentences were originally intended to be pre-recorded to ensure all children listen to the sentences with the same pronunciation, intonation, stress, and speed. However, in this study the sentences were spoken by the experimenter to allow the deaf children to lip-read. The volume was checked during the two practice sentences and each test sentence was presented once; repetitions were allowed in cases of environmental noise if the child had not started to repeat the sentence (no more than one repetition was given for any one sentence). The LITMUS SRep task can be scored in four different ways: whole sentence scoring; scoring in a range of 0-3; syntactic structure scoring and lexical error scoring. For the purpose of this study, whole sentence scoring and syntactic structure scoring were chosen. Whole sentence scoring assesses whether the child is able to repeat the sentence entirely correctly, while syntactic structure scoring enables the examiner to assess if the child can produce the target structure (regardless of whether there are lexical errors). Guidelines given on allowances that can be made were followed (e.g., allowing contractions such as "we'll" for "we will") but to improve scoring reliability, all sentences which were not repeated verbatim were checked with the first supervisor. It was also decided that when scoring for syntactic structure, if the child repeated the sentence but reversed the thematic roles this would be scored as being incorrect (e.g., target sentence = "The boy that the milkman helped has lost his way" and child repetition = "The milkman that the boy had helped lost his way").

To assess the home language(s) for the deaf children with SLM and hearing multilingual children the Student Oral Language Observation Matrix (SOLOM) (Parker et al., 1985) was used. Due to the wide range of home languages spoken, informal assessment was used. The SOLOM is an assessment of oral language skills in five domains: comprehension, fluency, vocabulary, pronunciation, and grammar (each scored on a five-point scale). The rating scale was originally designed to be completed by a child's teacher to assess English language proficiency; however, for the purpose of this study, a modified version (Appendix 4) was created to allow parents to rate their child's communicative competence in the home language. To create the adapted version for parents/carers the descriptions that correspond to the rating scale for each domain were reworded to ensure they were accessible for parents to understand and select appropriately.

3.3.5. Cognitive assessments

Two areas of cognition were assessed: EF and ToM. These two areas of cognition were chosen as they are frequently reported to be impaired in deaf children but at the same time often argued to be enhanced in typically developing multilingual hearing children (see Chapter 2). However, the interaction between deafness and spoken multilingualism and whether speaking multiple languages would act as a protective factor in cognitive development in deaf children is not known.

To assess EF the Behavior Rating Inventory of Executive Function (BRIEF) parent report questionnaire (Gioia et al., 2000) was used. EF can be assessed using experimental tasks and/or behaviour rating inventories. Experimental tasks involve presenting children with new problems that they would not encounter in day-to-day life and therefore cannot use automatic processes to solve them. Examples of experimental EF tasks include: the Odd One Out Span (e.g., Henry, 2001) to measure executive-loaded visuospatial working memory and the Children's Color Trails Test 1 and 2 (CCTT 1 & 2) (Llorente et al., 2003) to measure cognitive flexibility or switching.

However, the ecological validity of these assessment measures has been questioned as it is difficult to determine whether the differences observed under these experimental conditions translate to real-world situations (Burgess et al., 2006). Behaviour rating inventories on the other hand are designed to capture a child's EF skills within a real-world context during daily activities as opposed to artificial experiments. Due to the nature of the assessment, they also enable a wide range of EF skills to be assessed. At the same time these are not direct assessments as the information is obtained via caregiver reports.

The BRIEF was chosen as it has been frequently used with deaf children, both those who use spoken language and/or signed language to communicate (see Chapter 2). The BRIEF has both a parent and teacher form; however, due to the impact of Covid-19 on schools, only the parent version was used. The BRIEF Parent Form includes 86 items that measure different aspects of EF across eight clinical subscales. The clinical scales form two broader indexes; three of the subscales (Inhibit, Shift, Initiate) form the Behavior Regulation Index (BRI) while the other five subscales (Emotional Control, Working Memory, Planning/Organization, Organization of Materials, Monitor) form the Metacognition Index (MI). An overall score, the Global Executive Composite (GEC) is calculated by combining the BRI and the MI. Parents were asked to rate how frequently various behaviours relating to EF had been an issue for their child during the last six months (never, sometimes, or often). For the purpose of this study, the statements were read aloud to the parent by the researcher during the first video call who then scored the form in real-time. For the majority of cases, the child was not present when the parent completed the inventory; however, on a few occasions the child remained in the same room. In the present study, the GEC was reported as well as the BRI and MI, to allow comparisons to be made between the four groups of children on both their overall performance and on the two broader indexes.

To assess ToM development, the Theory of Mind Task Battery (ToMTB) (Hutchins & Prelock, 2010) was used. Assessment of ToM is typically achieved using false-belief tasks, where an individual must predict the behaviour of a character who holds a false belief that they do not share, such as The Sally-Anne Task (Baron-Cohen et al., 1985). However, the disadvantage of using traditional ToM tasks is that, if used in isolation, they only assess one aspect of ToM. Indeed, the idea that ToM is a unitary construct has been met with criticism (Bloom & German, 2000) and a more multidimensional approach is recommended (Dvash & ShamayTsoory, 2014). The ToMTB was chosen as it provides a direct assessment of a wide range of ToM competencies for children aged between two and 13 years old including: emotion recognition, desire-based emotion, seeing leads to knowing, line of sight, perception-based action, standard false belief, belief- and reality-based emotion and second order emotion, message-desire discrepancy, and second-order false belief. The tasks are presented in a story-book format and include characters representing a variety of races and ethnicities. The child can respond either verbally or non-verbally by pointing to the correct picture and the format of the ToMTB also made it easily transferable to online delivery.

The Theory of Mind Inventory-2 (ToMI-2) (Hutchins et al., 2016) was considered as an alternative assessment of ToM. Like the ToMTB, the ToMI-2 provides a broad measure of ToM functioning and is normed on children aged between two and 13 years of age. However, unlike the ToMTB, the ToMI-2 is a caregiver-informant tool used to assess ToM functioning within real world contexts. In addition, the ToMI-2 has the advantage that it is not influenced by cognitive, linguistic, and motivational factors related to the child. However, despite the advantages of using the ToMI-2, it was not chosen for the present study. The main reason for this was that the children's parents were already being asked to complete several background questionnaires, in addition to the BRIEF to assess their child's EF. Therefore, it was decided that asking the parents to complete another inventory would place too great a demand on their time and as a result the ToMTB was chosen instead. The ToMTB was suitable for online delivery, assessed a wide range of ToM competencies and has good test-retest reliability (Hutchins et al., 2008).

This chapter has sought to describe and justify the methodological approaches taken for each of the three studies included within this thesis. The topic of this thesis, SLM in deaf children, is an under-researched topic globally and within the context of the UK has not been the focus of any studies. A range of qualitative and quantitative methodological approaches were used to explore the topic, using surveys, one-to-one interviews and direct assessment. This enabled us to survey a large and diverse range of professionals to investigate their beliefs and practices, whilst capturing richer in-depth data on parents' decision-making experiences and on the language and cognitive abilities of deaf children with SLM. In the next three chapters attention will be turned to the findings of these three studies.

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Chapter 4: Deaf children with spoken language bilingualism: Professional guidance to parents

This chapter presents a study which explored the beliefs of professionals in the UK on whether deaf children can acquire two spoken languages. Specifically, this study focused on professional advice with respect to children who are diagnosed by six months old with a bilateral severe-to-profound sensorineural deafness, and who received bilateral cochlear implants by 24 months old. Professionals were asked about the factors affecting the likelihood of a deaf child developing two spoken languages. Finally, this study also investigated what advice professionals provide to multilingual parents on SLM for deaf children, and whether this advice is consistent across the different professional roles.

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Statement of Author Contribution

In the chapter entitled "Deaf children with spoken language bilingualism: Professional guidance to parents", the authors agree to the following contributions:

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4.1 Abstract

13% of deaf children in the UK use more than one spoken language. Parents of deaf children from bilingual backgrounds must decide whether to communicate with their child using more than one spoken language, with or without a signed language(s) as well. As most deaf children are born to hearing parents with little or no knowledge of deafness, professional guidance received during this decision-making process is critical. This study examined the beliefs of professionals on the ability of a deaf child to acquire two spoken languages and the advice professionals give to parents considering spoken language bilingualism for their deaf child. 108 professionals who work with deaf children in the UK (50 Teachers of the Deaf [ToDs], 47 speech and language therapists [SLTs] and 11 audiologists) completed an online questionnaire between the 24th May 2019 and the 1st July 2019. Most participants believed deaf children can achieve spoken language bilingualism and would advise parents to speak in their home language, regardless of the parents' English proficiency. However, audiologists were 11 times more likely than SLTs to report linguistic confusion, and ToDs at least 11 times more likely than SLTs to report reduced proficiency in English and the home language because of bilingualism. ToDs and SLTs were found to play a key role in bilingual parents' decision-making process. Consequently, there is a need for specific training and interprofessional learning to ensure parents receive consistent evidence-based advice.

4.2. Introduction

There are more than 53,000 deaf children living in the UK, 13% of whom use more than one spoken language (Consortium for Research into Deaf Education [CRIDE], 2019). In parts of the UK this figure is much higher; Great Ormond Street Cochlear Implant Centre reported that 28% of children receiving cochlear implants were from families where the home language was a spoken language other than English (Mahon et al., 2011). However, relatively little is known about the guidance that education and healthcare professionals give to parents who are considering raising their deaf child to use more than one spoken language.

In this paper, the term deaf is used to refer to all levels and types of deafness. This term is currently used by national UK organizations such as the National Deaf Children's Society (NDCS) and the British Association for Teachers of the Deaf (BATOD). Specific audiological information is provided where required.

This paper's focus is limited to spoken language bilingualism. Definitions of bilingualism vary widely; for the purpose of this study, an individual is considered to be bilingual if they can produce or comprehend two spoken languages "regardless of the level of proficiency, use, and the age at which the languages were learned" (Grech & McLeod, 2012, p. 121).

Spoken language development in deaf children can be influenced by many factors, including the child's audiological profile (e.g. age of diagnosis and receiving cochlear implants), age of the child when they started intervention and parent–child interaction and engagement (Duchesne & Marschark, 2019; Nicastri et al., 2021; Yoshinaga-Itano, 2003). For deaf children acquiring two spoken languages, language outcomes are also related to the quantity and quality of exposure to each language (Teschendorf et al., 2010; Waltzman et al., 2003; Yim, 2012), and whether intervention is provided in one or both languages (Bunta et al., 2016).

Research on spoken language bilingualism in deaf children is limited, but emerging evidence suggests deaf children can learn two spoken languages (Bunta et al., 2016; Bunta & Douglas, 2013; Guiberson, 2014; McConkey Robbins et al., 2004). A review of 22 studies looking at communication outcomes in deaf children with two spoken languages, found that, whilst there was a high degree of variability, there was no adverse effect of bilingualism (Crowe, 2018). Based on the current evidence-base Crowe (2018) concluded that professionals should not discourage parents from considering spoken language bilingualism for their deaf child.

Parents must decide whether to communicate with their deaf child using a signed language, spoken language, or both. Bilingual parents have the additional option of raising their deaf child to use two spoken languages. Most deaf children are born to hearing parents (Mitchell & Karchmer, 2004), who are therefore likely to have little or no prior knowledge or experience of deafness. Yet, communication decisions are often made by parents soon after their child has been identified as deaf. As a result, the decision-making process can be challenging, especially when the possibility of multiple spoken languages is introduced. The information that professionals provide, particularly those in health and education, can therefore be highly influential. In an online survey on parents' communication choices for their deaf children in the USA, Decker et al. (2012) reported that more than 71% of parents stated the main source of information on communication options for their deaf child came from medical professionals, speech and language pathologists (SLPs), and audiologists.

Parents of deaf children are likely to encounter several different early intervention professionals, both within healthcare and education. These professionals are likely to include, but are not limited to, Speech and Language Therapists (SLTs), audiologists and Qualified Teachers of the Deaf/Teachers of the Deaf (QToDs/ToDs). BATOD distinguishes between QToDs who hold the Mandatory Qualification and ToDs who are due to start or are in the process of completing the mandatory training. As a result, professionals will often be an important source of information in decision making concerning language choice (Crowe et al., 2014). In line with the concept of family-centered care, professionals have a responsibility to enable parents to be active participants in the decision-making process. Specifically, parental engagement is facilitated when professionals provide relevant information at the appropriate time (Moeller et al., 2013). The lack of research evidence on communication outcomes for deaf children with spoken language bilingualism presents a challenge for professionals supporting parents through their decision-making on language choice.

Although numerous research studies have explored parental communication choices for their deaf child (Ching et al., 2018; Scarinci et al., 2018; Watson et al., 2008; Wheeler et al., 2009), very few have focused specifically on decision-making concerning spoken language bilingualism. Studies in the UK and the USA on communication mode report that the advice of medical or education professionals most frequently influences parental decisions, especially immediately after their child's deafness is diagnosed (Eleweke & Rodda, 2000; Kluwin & Stewart, 2000). Similar findings have been reported for decision-making associated with spoken language bilingualism in deaf children. SLTs, audiologists and deaf educators were the three professional roles most involved in the decision-making process of parents of deaf children in Spain (Guiberson, 2013).

The actual advice given to parents considering spoken language bilingualism is less consistent though. Research in the USA shows parents were often advised by professionals to speak only English to their deaf child (Guiberson, 2005; McConkey Robbins et al., 2004;

Steinberg et al., 2003; Waltzman et al., 2003). More recently in Spain, Guiberson (2013) found that half the parents were encouraged to raise their child with two spoken languages, although this study did not differentiate who the advice came from and included family and friends in addition to professionals.

Despite bilingual parents of deaf children frequently reporting professional advice to be a strong influencing factor in their language choice, only two studies have explored what advice is given on spoken language multilingualism from the professionals' perspective. Crowe and McLeod (2016) conducted a study on 16 Australian professionals who worked with deaf children from multilingual families. All participants reported that they would sometimes or always recommend the use of more than one spoken language for deaf children, and that doing so provided good language models and encouraged a sense of belonging. Similarly, Crowe and Guiberson (2021), also reported that all 19 professionals in their study who worked with deaf children from multilingual families in Australia, encouraged and supported the use of a spoken language other than English. Furthermore, participants highlighted the role of professionals in supporting parents to make informed language choices by engaging in family-centered practice and using research evidence. However, they frequently stressed the lack of available research on outcomes and interventions for multilingual deaf children.

Despite the increasing number of bilingual families in the UK, and the potential influence that professionals have in their decision-making, no research has explored the advice that professionals in the UK give to parents who are considering raising their deaf child with more than one spoken language. It is critically important that we understand what factors professionals consider when giving advice to ensure parents make informed decisions.

The present study provides an overview of the advice given by UK professionals to parents during this decision-making process. The study also explores professionals' beliefs on the ability of deaf children to acquire more than one spoken language, on the factors that can influence language outcomes in bilingual deaf children, and the consequences of different language choices.

4.2.1. Research questions

Due to the heterogeneity of deaf children, research questions sometimes focused on a specific sub-set of deaf children.

1. What are the beliefs of professionals on spoken language bilingualism in deaf children with a bilateral severe-to-profound sensorineural deafness and cochlear implants?

    a. Can a deaf child become bilingual in two spoken languages?

    b. Does the presence of additional speech and/or language impairments (e.g. Developmental Language Disorder (DLD)) affect the ability of a deaf child to become bilingual in two spoken languages?

    c. What factors affect the ability of a deaf child to become bilingual in two spoken languages?

    d. What are the potential consequences of exposing a deaf child to two spoken languages?

2. What advice do professionals give to parents who have a deaf child on raising their child to use two spoken languages?

    a. Do professionals believe they have a role in the decision-making process parents experience when deciding whether to raise their deaf child to be bilingual in two spoken languages?

b. Does the advice given by professionals to parents on whether to raise their deaf child to become bilingual in two spoken languages differ depending on whether the parent is a proficient speaker of English?

4.3. Materials and methods

4.3.1. Data collection

The study was given ethical approval by the University of Reading's Research Ethics Committee. All participants gave informed consent before taking part. A pilot questionnaire was completed by four SLTs, one QToD, and one audiologist who were experienced with working with deaf children to establish content validity. The final questionnaire was available on the onlinesurveys.ac.uk platform between the 24th May 2019 and the 1st July 2019 and took approximately 15 minutes to complete. The first section investigated the participants' professional beliefs about a deaf child's ability to learn two spoken languages. The second section explored the advice on spoken language bilingualism professionals give to parents of a deaf child. The third section gathered demographic information about the participants. A copy of the survey questions can be found in Appendix 1.

4.3.2. Recruitment strategy

Participants were recruited via several methods. Respondents needed to be QToDs/ToDs, SLTs, or audiologists currently working in the UK with deaf children. Emails were sent to settings in the UK which educate/support deaf children, including education settings, National Health Service (NHS) departments, charities, and independent organisations. The Royal College of Speech and Language Therapists (RCSLT), the British Academy of Audiology

(BAA), BATOD, and the NDCS helped to promote the project and recruit participants. The authors also advertised the project on Twitter.

4.3.3. Analyses

The data were analyzed using SPSS v. 25. Descriptive statistics were calculated for each of the professional roles and logistic regression analyses were conducted to examine the relationship between the professionals' background variables and the likelihood that they would respond positively to the questions. Due to the small sample of ToDs ($n = 4$), the responses for QToDs and ToDs were combined into one category.

The Likert 4-point Rating Scales ("completely true", "mostly true", "partially true" and "not true") were collapsed into dichotomous levels due to the small sample size within some groups. "Completely true" and "mostly true" were grouped together and "partially true" and "not true" were grouped together. For all logistic regression analyses the following professional background variables were used: professional role, number of years since qualifying, previous training on spoken language bilingualism in deaf children, knowledge of other languages, and having spoken language bilingual deaf children (not including British Sign Language (BSL)) on their caseload. Statistical significance was set at $p < 0.05$.

4.4. Results

4.4.1. Participants

A total of 108 professionals who work with deaf children (0-18 years) in the UK participated in the study. The sample comprised: 50 QToDs/ToDs (46.3%), 47 SLTs (43.5%) and 11 audiologists (10.2%). We distinguished between QToDs and ToDs in the survey to reflect

BATOD's classification, however, because only four ToDs participated, we combined their responses with the QToDs.

Three of the four professional roles require a university degree (QToDs, SLTs and audiologists). 77.8% of those participants who worked in a qualified role completed their training six or more years ago. 38% of all participants were currently working in London, 1.9% in Scotland and 7.4% in Northern Ireland, and there were no respondents from Wales. Only 5.6% of participants had worked with deaf children for less than a year, while 26.9% had worked with this population for more than 21 years. Within each professional role, participants worked with children across all four age groups (under 5 years, 5–11 years, 11–16 years and 16–18 years). Participants were employed in specialist pre-schools for the deaf, hearing impairment units in mainstream schools, cochlear implant centres, specialist Schools for the Deaf, hospitals, independent organisations, university clinics and Sure Start centres.

65.7% of participants reported they had knowledge of another language(s) (spoken and/or signed) (63.8% of SLTs, 36.4% of audiologists and 74.0% of QToDs/ToDs). 32.4% of participants had received some form of additional training on working with deaf children with spoken language bilingualism (34.0% of SLTs, 9.1% of audiologists and 36.0% of QToDs/ToDs) and 90.7% confirmed they would like to receive additional training in this area (SLTs = 89.4%, audiologists = 90.9% and QToDs/ToDs = 92.0%). Overall, 74.1% of participants had worked with deaf children with spoken language bilingualism (not including BSL).

4.4.2. The beliefs of professionals on spoken language bilingualism

For each of the survey questions that elicited the information for Research Question 1, respondents were asked to answer with reference to a deaf child (with hearing parents) in their caseload age range who has a bilateral severe-to-profound sensorineural deafness (diagnosed before 6 months old) and who received bilateral cochlear implants by the age of two.

Respondents were asked to rate on a four-point scale how true the following statement is: “The child has the potential to develop two spoken languages (including English).” 95.7% of SLTs, 100% of audiologists and 84.0% of QToDs/ToDs stated it was “completely true” or “mostly true”. Professional background variables did not affect the probability of rating this statement as mostly or completely true, $\chi^2(6) = 11.69$, $p > .05$.

4.4.2.1. The effect of speech and language impairments

Participants were asked to rate how true they felt the following statement was: “The child has the potential to develop two spoken languages (including English) if they have additional speech and/or language impairments.” 68.1% of SLTs, 54.5% of audiologists and 46.0% of QToDs/ToDs stated it was “completely true” or “mostly true”. Professional background variables did not affect the probability of rating this statement as mostly or completely true, $\chi^2(6) = 9.34$, $p > .05$.

4.4.2.2. Factors affecting spoken language bilingualism

The descriptive statistics (Table 1) show that all participants agreed that the quantity of exposure to two languages affects a deaf child’s ability to acquire two spoken languages. Age of diagnosis, age of receiving hearing technology, presence of additional speech, language and/or communication impairments or comorbid diagnoses and opportunities to speak the two languages were also almost all rated by all participants, across all professional roles, as factors affecting the ability to achieve spoken language bilingualism. Twice as many audiologists (81.8%) compared to SLTs (40.4%) agreed that enrolment in an oral-aural programme was a contributing factor to acquisition of two spoken languages in deaf children.

Table 1. Descriptive statistics for professional views on factors that affect the ability of deaf children, with a bilateral severe-to-profound sensorineural deafness and cochlear implants, to become bilingual in two spoken languages

Factor	Percentage of each professional role who responded "yes"		
	SLT	Audiologist	QToD/ToD
Degree of deafness	59.6%	63.6%	86.0%
Age of diagnosis	91.5%	100%	100%
Type of hearing technology used	55.3%	72.7%	76%
Age of receiving hearing technology	95.7%	100%	100%
SES of the family	44.7%	72.7%	56.0%
Enrolment in an oral-aural program	40.4%	81.8%	50.0%
Presence of additional speech, language and/or communication impairments	85.1%	100%	96.0%
Presence of comorbid diagnoses	87.2%	100%	92.0%
Parent's proficiency level in English	57.4%	45.5%	84.0%
Quantity of exposure to the two languages	100%	100%	100%

Opportunities to speak the two languages	100%	100%	98.0%
What language the main caregiver speaks	48.9%	90.9%	84.0%
Whether both parents speak the home language to the child	38.3%	54.5%	56.0%
Number of different speakers in the two languages that interact with the child	61.7%	72.7%	86.0%

A logistic regression was performed for each of the 14 factors. The models for the following factors were statistically significant: age of diagnosis, parents' proficiency level in English, what language the main caregiver speaks, and the number of different speakers in the two languages that interact with the child. For the factor "age of diagnosis" the model was statistically significant $\chi^2(6) = 16.69, p < .05$; however, no individual predictors were statistically significant, $p > .05$.

For the factor "parents' proficiency level in English", $\chi^2(6) = 13.88, p < .05$, QToDs/ToDs were more than 4 times more likely than SLTs to report that this factor can affect the ability of a deaf child achieving spoken language bilingualism ($p < 0.01$).

For the factor "what language the main caregiver speaks", $\chi^2(6) = 21.78, p < .01$, audiologists were more than 14 times more likely than SLTs ($p < 0.05$) and QToDs/ToDs were more than 4 times more likely than SLTs ($p < 0.01$) to report that this factor can affect the acquisition of two spoken languages in deaf children.

QToDs/ToDs were more than 3 times more likely than SLTs ($p < 0.05$) to agree that the "number of different speakers in the two languages that interact with the child significantly affects a deaf child's opportunity to become bilingual" $\chi^2(6) = 13.25, p < .05$.

None of the other 10 models were statistically significant.

4.4.2.3. Potential consequences of bilingual exposure

Descriptive statistics (Table 2) show that almost all participants across all professional roles stated that exposure to two spoken languages results in maintenance of the home language, improved family relationships and dynamics, access to the culture of the home language and better identity/sense of self. 72.7% of audiologists (compared to only 17.0% of SLTs and

26.0% of QToDs/ToDs) stated that linguistic confusion can be a consequence of exposing deaf children to two spoken languages, while 27.3% of audiologists (compared to only 4.3% of SLTs and 4.0% of QToDs/ToDs) said that speech, language and/or communication difficulties could arise.

Table 2. Descriptive statistics for professional views on consequences of deaf children, with a bilateral severe-to-profound sensorineural deafness and cochlear implants, being exposed to two spoken languages.

Potential consequence	Percentage of each professional role who responded "yes"		
	SLT	Audiologist	QToD/ToD
Home language maintenance	97.9%	90.9%	94.0%
Improved family relationships and dynamics	100%	90.9%	100%
Linguistic confusion	17.0%	72.7%	26.0%
Access to culture of heritage language	97.9%	90.9%	98.0%
Better identity/sense of self	97.9%	90.9%	98.0%
Difficulties with peer relationships	2.1%	9.1%	8.0%
Speech, language and/or communication difficulties	4.3%	27.3%	4.0%
Reduced proficiency in English	2.1%	18.2%	16.0%

Reduced proficiency in the home language	2.1%	18.2%	18.0%
Advantages in cognitive skills	83.0%	63.6%	88.0%
Reduced academic achievement in English at school	2.1%	18.2%	12.0%

A logistic regression was performed for each of the 11 statements. The models for the following consequences were significant: linguistic confusion, reduced proficiency in English, and reduced proficiency in the home language.

Audiologists were more than 11 times more likely than SLTs to agree that linguistic confusion can be a consequence of bilingual exposure, $\chi^2(6) = 18.65$, $p < .01$. There was also a small difference for the predictor "knowledge of another language", with participants who were bi/multilingual themselves being more than 0.3 times less likely to report linguistic confusion.

For reduced proficiency in English, $\chi^2(6) = 13.53$, $p < .05$, QToDs/ToDs were more than 11 times more likely than SLTs to report this as a potential consequence.

For reduced proficiency in the home language, $\chi^2(6) = 15.21$, $p < .05$, QToDs/ToDs were more than 12 times more likely than SLTs to report that exposure to two spoken languages could lead to reduced proficiency in the home language.

None of the other 9 models were statistically significant.

4.4.3. Professionals' advice

For each of the survey questions that elicited the information for Research Question 2, no specific audiological information was given as the questions aimed to identify the advice professionals give in general to bilingual parents of deaf children.

4.4.3.1. Professionals' perceived role in parents' decision-making

Seventy-seven percent of SLTs, 36.4% of audiologists and 64.0% of QToDs/ToDs reported that they are asked by parents whether they should speak English or their home language with their child. The logistic regression including the predictor variables was statistically significant, $\chi^2(6) = 35.47$, $p < .01$. Participants with bilingual deaf children on their caseload were more than 18 times more likely to be asked than those without. There was also a significant but negligible effect for professional role, with audiologists 0.1 times less likely than SLTs to be asked for advice.

When asked if they would give advice regarding language choice, regardless of whether they had been asked before, 97.9% of SLTs, 72.7% of audiologists and 94.0% of QToDs/ToDs stated that they would. A logistic regression was not statistically significant, $\chi^2(6) = 9.51$, $p > .05$.

Participants were asked to rate the following statement: “The decisions parents make about what language(s) to speak to their deaf child in are influenced by the advice they receive from professionals.” 70.2% of SLTs stated it was “completely true” or “mostly true” compared to 36.4% of audiologists and 40% of QToDs/ToDs. A logistic regression was not statistically significant, $\chi^2(6) = 11.08$, $p > .05$.

Next, participants rated the following statement: “Professionals have a role in helping to advise parents of deaf children on what language(s) they should speak to their child in.” The majority of SLTs (80.9%) responded “completely true” or “mostly true”, compared to only 36.4% of audiologists and 56% of QToDs/ToDs. A logistic regression was not statistically significant, $\chi^2(6) = 12.28$, $p > .05$.

4.4.3.2. Does the advice given to parents differ depending on whether the parent is a proficient speaker of English?

Participants were given the statement: “Professionals should advise parents to speak their home language to their deaf child.” They were asked to rate the statement on a 4-point scale for two different scenarios.

First, participants were asked to consider a parent whose first language is not English and who does not speak English proficiently. Almost all participants responded that it was “completely true” or “mostly true” that the parent should be advised to speak their home language: 100% of SLTs, 81.8% of audiologists and 94.0% of QToDs/ToDs. A logistic regression was not statistically significant, $\chi^2(6) = 10.24$, $p > .05$.

Second, participants were asked to consider a parent whose first language is not English but who does speak English proficiently. Similar to the first scenario, almost all SLTs (91.5%) and audiologists (90.9%) stated it was “completely true” or “mostly true” that the parent should be advised to speak their home language to their deaf child. Slightly fewer QToDs/ToDs (74%) responded with “completely true” or “mostly true”. A logistic regression was not statistically significant, $\chi^2(6) = 12.46$, $p > .05$.

Participants were then asked to rate the following statement: “Asking the parent to speak in their home language will have a negative effect on their child’s English language skills.” When considering a parent whose first language is not English and who does not speak English proficiently, the majority of participants stated that it was “not true” that asking the parent to speak in their home language would have a negative effect on their child’s language development in English (SLTs = 95.7%, audiologists = 72.7% and QToDs/ToDs = 76.0%). A logistic regression was not statistically significant, $\chi^2(6) = 5.00$, $p > .05$.

With the second scenario, a parent whose first language is not English but who does speak English proficiently, again nearly all SLTs (97.9%) stated that it was “not true” that parents speaking the home language would be detrimental to the child’s English compared to 72.7% of audiologists and 78.0% of QToDs/ToDs. A logistic regression was not statistically significant, $\chi^2(6) = 9.80$, $p > .05$.

4.5. Discussion

4.5.1. Professional beliefs on spoken language bilingualism for deaf children

Overall, nearly all participants generally agreed that deaf children, with a bilateral severe-to-profound sensorineural deafness (diagnosed before the age of six months) and who received bilateral cochlear implants by the age of two, can develop two spoken languages. This may suggest that the participants would also believe that deaf children with less severe types of deafness, and indeed unilateral as opposed to bilateral deafness, would also be able to achieve spoken language bilingualism.

Research into the development and outcomes of spoken language bilingualism in deaf children is very limited and has produced mixed results; however, emerging evidence suggests acquisition of two or more spoken languages is possible for this population (Crowe, 2018). The participants' positive attitudes towards spoken language bilingualism could be in response to the evidence base, or alternatively may have been due to their own professional experience. On average, three quarters of respondents had worked with deaf children who used more than one spoken language, and their strong professional opinions on the possibility of spoken language bilingualism may reflect what they see deaf children achieve in their own practice. Previous research on professionals' perspectives on spoken language multilingualism in Australia also indirectly suggests that professionals (including SLPs and ToDs) would agree that the acquisition of multiple spoken languages is attainable for deaf children. Crowe and McLeod (2016) and Crowe and Guiberson (2021) report that 93.8% and 78.9% of professionals respectively, mildly, or strongly disagreed that exposure to more than one language is confusing for deaf children.

The professionals' perspective greatly changed with the presence of additional speech and/or language impairments, with far fewer stating it was "completely true" or "mostly true" that spoken language bilingualism is achievable. Whilst there was a great reduction in the number of participants across all three professional groups, SLTs were the profession with the greatest percentage of participants expressing a favourable view. These findings are consistent with those of Crowe and Guiberson (2021) in which professionals described having other needs in addition to being deaf as a negative influence on the likelihood that deaf children could achieve spoken language multilingualism.

Respondents may have expressed reservations about the possibility of spoken language bilingualism for deaf children with additional speech and/or language impairments due to their presence in addition to a degraded auditory system. Spoken language bilingualism has been suggested to intensify the difficulties deaf children have acquiring speech and language due to placing greater demands on their degraded auditory system by forcing it to differentiate between sounds of more than one language (Crowe & McLeod, 2016). Deaf children have consequently been reported to be at risk of not acquiring either language proficiently (Waltzman et al., 2003), although the evidence base is conflicting, and studies have demonstrated deaf children can achieve proficiency in two languages (Bunta et al., 2016; Bunta & Douglas, 2013; Guiberson, 2014; McConkey Robbins et al., 2004). The present study's findings that more SLTs believed spoken language bilingualism is possible for deaf children with additional speech and language impairments might relate to the specific training they may receive on multilingualism and language development, specifically how multilingualism is not responsible for speech and/or language difficulties (Cruz-Ferreira, 2011).

In terms of predictive factors, nearly all participants agreed that quantity of exposure and opportunities to speak the two languages affects the ability of a deaf child to become bilingual in two spoken languages. This is in line with previous research that in deaf children acquiring two languages, outcomes are associated with the quantity and quality of exposure to each language (Waltzman et al., 2003; Yim, 2012).

The majority of participants also agreed that exposure to two spoken languages has many positive outcomes including improved family relationships, better identity/sense of self, maintenance of the home language and access to their cultural heritage. Interestingly, audiologists were more than 11 times more likely than SLTs to state that exposure to two spoken languages could lead to linguistic confusion (72.7% vs 17.0%). These results were higher than those reported in Crowe and McLeod's (2016) study where only 6.3% of professionals (including SLPs and ToDs) mildly agreed (and none strongly agreed) that exposure to more than one language is confusing for deaf children.

A possible explanation for audiologists being more likely to report linguistic confusion because of exposure to two spoken languages may be reflected in the demographics of the participants. Only 36.4% of audiologists in the present study reported knowledge of another language(s), compared to 63.8% of SLTs and 74.0% of QToDs/ToDs. Additionally, only 9.1% of audiologists reported having received training on working with deaf children with spoken language bilingualism. In comparison, 34.0% of SLTs and 36.0% of QToDs/ToDs stated they had received relevant additional training. Interestingly, despite similar frequency of specific training, QToDs/ToDs were also more than 11 times more likely than SLTs to report reduced proficiency in English as a result of bilingual exposure (16.0% vs 2.1%), and more than 12 times more likely than SLTs to report reduced proficiency in the home language as a result of bilingual exposure (18.0% vs 2.1%). In the absence of additional information on the content of the training received, we can only speculate that the nature of the content of the professional training may be responsible for this discrepancy.

A second possible explanation may be due to SLTs having a greater overall experience working with multilingual children, both those who are deaf and those with typical hearing. Exact figures of the number of SLTs who work with bilingual children in the UK are unavailable. However, with just over 21% of primary school aged pupils in the UK recorded as having English as an additional language (GOV.UK, 2021) and Developmental Language Disorder (DLD) estimated to affect approximately 7% of the population (Norbury et al., 2016), the likelihood that SLTs will have worked with bilingual children is relatively high, particularly in multicultural cities like London where 38% of our respondents were based. Because of their linguistics training, SLTs may also be less likely to perceive code-switching, the use of more than one language in the same sentence or conversation (Myers-Scotton, 2006), as a sign of linguistic confusion or as a strategy to fill in gaps of vocabulary knowledge but recognise it as a sign of proficient bilingualism (Yow et al., 2018).

4.5.2. Professional advice given to parents

The second aim of our study was to explore the advice professionals give to parents considering spoken language bilingualism for their deaf child. Our results show that QToDs/ToDs and SLTs play an important role in bilingual parents' decision-making process as they are routinely consulted by parents about which language(s) they should use with their deaf child. Conversely, audiologists seem to play a less significant role, with only just over a third of participants reporting they are asked for advice. However, nearly all QToDs/ToDs and SLTs, and just under three quarters of audiologists said they would give advice if asked. This view is consistent with previous research on professionals where participants highlighted that their role included supporting decision-making by providing advice on multilingualism to families (Crowe & Guiberson, 2021). It may be that, while audiologists play a key role in a deaf child's development, parents in the UK particularly value the emphasis on language and communication that QToDs/ToDs and SLTs bring from their specialist training.

Our findings also suggest that SLTs believe more strongly than the other professional groups that the decisions parents make are ultimately influenced by the advice they provide. This is consistent with parental accounts in the UK and USA who reported advice provided by professionals in medicine and education to be the factor that most frequently influences decisions on communication choices for deaf children (Eleweke & Rodda, 2000; Kluwin & Stewart, 2000). However, the beliefs of the audiologists and QToDs/ToDs who participated in the present study are in line with a more recent study by Decker et al. (2012) in the USA who found that whilst 71% of parents reported that SLPs, audiologists and medical professionals were sources of information, only 14% said SLPs and audiologists were influential in their communication choices, and the figured dropped to 9% for medical professionals.

Regarding the advice that professionals provide, almost all participants agreed that professionals should advise parents to speak to their deaf child in their home language, regardless of whether the parent speaks English proficiently or not. These results are in line with previous research conducted in Australia both by Crowe and McLeod (2016) – where all participants sometimes or always recommended the use of more than one spoken language for deaf children – and by Crowe and Guiberson (2021), whose participants all stated they supported and promoted spoken language multilingualism in deaf children. However, the findings are not consistent with parental accounts of advice received from professionals in the USA where parents report being advised to speak only English with their deaf child and not their home language (Guiberson, 2005; McConkey Robbins et al., 2004; Steinberg et al., 2003; Waltzman et al., 2003). The discrepancies between the more recent studies on professionals' perspectives and older studies focusing on parental accounts may reflect evolving attitudes towards multilingualism.

The fact that our participants agreed that parents should be advised to speak their home language irrespective of whether they speak English proficiently could suggest that they believe parents may provide a less than optimal language model in their non-native language. Encouraging parents to speak a language they are not proficient in might affect the quantity and quality of the linguistic input their deaf child receives. Both dimensions of the linguist input are widely acknowledged to play a crucial role in a child's language development (Newman et al., 2016; Rowe, 2012).

The professionals' advice may also demonstrate their awareness that the benefits of maintaining the home language extend beyond linguistic proficiency. Nearly all participants agreed that exposure to two spoken languages results in maintenance of the home language, improved family relationships, access to the cultural heritage, and better identity/sense of self. Professionals who participated in Crowe and Guiberson's (2021) study also focused on the importance of the home language in facilitating communication with family and the wider community and supporting the development of identity and wellbeing.

4.5.3. Future directions and limitations

The present study has limitations related to the sample size, in particular the small number of audiologists ($n = 11$) who participated. In addition, the participants may not be representative of all QToDs/ToDs, SLTs and audiologists who work with deaf children in the UK. Professionals who participated were likely to have had a stronger interest and knowledge of multilingualism than professionals who chose not to participate as 65.7% reported they had knowledge of another language(s) (spoken and/or signed). This could have led to selection bias.

Additionally, the geographical spread of participants was uneven, with 38% of all participants working in London and no participants working in Wales. The survey was also limited in its scope; due to the heterogeneity of deaf children and the impact that a child's audiological profile can have on language development, professional beliefs on spoken language bilingualism focused on deaf children with a bilateral severe-to-profound sensorineural deafness who use bilateral cochlear implants, but not on any other types/degrees of deafness.

Future research on advice regarding spoken language bilingualism should consider including other professional roles who encounter deaf children, particularly in the early years, including medical staff (e.g. audiological physicians, Ear Nose and Throat (ENT) Surgeons, General Practitioners (GPs) and health visitors). The use of different methodologies such as interviews and/or focus groups may also help to provide a more in depth understanding of the advice professionals give to parents, compared to survey data. Secondly, research should examine the decision-making process around spoken language bilingualism for deaf children from the parents' perspective in the UK by investigating the internal and external factors that impact their communication choices and to what extent professional advice influences their decision.

4.6. Conclusions

This is the first survey looking at the beliefs held by UK professionals on whether a deaf child can acquire two spoken languages, and the advice they give to parents considering spoken language multilingualism for their deaf child. Nearly all participants stated spoken language bilingualism is achievable, although far fewer agreed when additional speech and/or language impairments were present, and audiologists and QToDs/ToDs were considerably more likely than SLTs to report linguistic confusion and reduced proficiency respectively. However, most participants agreed that professionals should advise parents to speak to their deaf child in their home language, regardless of their proficiency in English, acknowledging the wider benefits of bilingualism. QToDs/ToDs and SLTs in particular played a key role in bilingual parents' decision-making process in this UK sample, highlighting their responsibility to enable parents to make informed decisions.

To ensure parents receive the advice needed to make fully informed decisions, we recommend that all professionals working with deaf children complete specific training on spoken language multilingualism. This is particularly crucial for those professionals whose university curriculum did not include training on language development in bilingual populations. A review of relevant university training courses to ensure that they include a focus on multilingual populations and multicultural issues is also recommended. Additionally, interprofessional collaboration should be encouraged to ensure specialist knowledge on language development and multilingualism is shared. Finally, further research on the language outcomes of deaf children using more than one spoken language is needed to enable professionals to provide evidence-based advice.

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Chapter 5: Spoken language multilingualism in deaf children: Parental decision-making

Chapter 4 demonstrated the key role that professionals, in particular speech and language therapists and Teachers of the Deaf, play in the decisions multilingual parents make about raising their deaf child with more than one spoken language. This chapter presents a qualitative study exploring the decision-making process around SLM from the parents' perspective. Reflexive thematic analysis of one-to-one interviews focused on family language policy in 7 multilingual families of deaf children and 7 multilingual families of hearing children. The themes shed new light on the factors, including professional advice, that influence parents' decisions on whether to raise their deaf child with multiple spoken languages. In addition, this study provides a unique comparison between the decision-making process for multilingual parents of deaf children and multilingual parents of hearing children.

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Statement of Author Contribution

In the chapter entitled "Spoken language multilingualism in deaf children: Parental decision-making", the authors agree to the following contributions:

Emily Wright – 75% (Experimental design, data collection, data analysis and writing)

Signed: Date: 8.12.2022

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Ludovica Serratrice – 20% (Experimental design, data analysis and review)

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5.1. Abstract

Parents of deaf children must decide whether to raise their child using spoken and/or signed language. Multilingual parents have the additional decision of whether to use multiple spoken languages (with or without a signed language as well). These communication choices – which can be both explicit and implicit – can change over time and are known as a Family Language Policy (FLP). This study provides a reflexive thematic analysis of semi-structured interviews with multilingual parents of deaf children who chose spoken language multilingualism (SLM), and with multilingual parents of hearing children who also chose to raise their children with more than one language. We identified four key themes which influenced the decisions parents made on SLM: (1) additional benefits for the child; (2) knowledge and professional advice; (3) family and social influences; and (4) family dynamics and negotiation. The results highlight the complexity of the decisions behind FLPs for multilingual parents of deaf children and the strong influence that factors within and outside the family can have.

5.2. Introduction

Linguistic diversity amongst deaf children is increasing; in the U.K., 13% of deaf children are from families using another spoken language at home in addition to English (Consortium for Research into Deaf Education [CRIDE], 2019). For multilingual parents, when their home language is not the country's main language, decision-making around communication choice for their deaf child includes the additional decision of whether to use multiple spoken languages, with or without a signed language as well. These language choices parents make can be described in terms of a Family Language Policy (FLP) (King et al., 2008), a set of explicit and implicit choices regarding "a particular language use pattern and particular literacy practices within home domains and among family members" (Curdt-Christiansen, 2009, p. 352). These choices are in turn constrained by a complex network of social, political, economic, and cultural factors at the macro (societal) and micro (family) level (see Curdt-Christiansen, 2009, p. 355). This is particularly true for families of deaf children in the U.K. who wish to use British Sign Language (BSL) with their children due to high costs and unequal access to BSL courses. Maintaining the spoken home language in addition to the country's majority language is also time-consuming and resource-intensive, especially so in monolingual societies. Different families in different contexts will therefore have a different set of choices at their disposal. As a consequence, their level of agency in making FLP choices will vary.

FLPs are important to understand due to their long-lasting influence on identity, well-being, and family relationships (Müller et al., 2020), and focus should be extended to more diverse family types, languages, and contexts (King, 2016). In the present study, the focus is on multilingual parents of deaf children/parent of a deaf child (PODC), for whom the issue of FLP exists both in terms of decisions relating to the maintenance of their home language(s) and their relationship with the Deaf community by introducing a signed language. In this paper when referring to D/deaf individuals, the term "Deaf" will be used to refer to individuals who use sign language to communicate and who identify as members of the signing Deaf community. The term "deaf" on the other hand will be used to refer to individuals with all levels of deafness but who do not identify as members of the signing Deaf community.

There is a considerable body of research on parental decision-making between spoken language and/or sign language (e.g. Ching et al., 2018; Crowe, Fordham, et al., 2014); however, limited research has focused on spoken language multilingualism (SLM). Various factors have been reported to influence the communication choices (sign language, one or more spoken languages) that parents make for deaf children, including, but not limited to, the information parents receive, the child's characteristics, parental expectations, and identity (Ching et al., 2018; Crowe, Fordham, et al., 2014; Wheeler et al., 2009).

Information is a key component in parental decision-making with professionals, specifically within medicine, allied health, and education, frequently reported as a key source of knowledge on spoken and/or signed communication (including spoken multilingualism), and an important influence on the decisions parents make (Crowe, Fordham, et al., 2014; Crowe, McLeod, et al., 2014; Decker et al., 2012). Professional advice can also be a significant factor for multilingual PODC. Parents in the U.S.A. were frequently advised by professionals to speak only English (Guiberson, 2005; McConkey Robbins et al., 2004; Waltzman et al., 2003), with Spanish-speaking parents following professional advice to use English and American Sign Language (ASL), despite expressing a desire to raise their deaf child with Spanish and English (Steinberg et al., 2003). Friends, family, and caregivers of other deaf children have also been found to be sources of information and influential in parental communication choices on whether to use one or more spoken languages and/or sign language

(Crowe, Fordham, et al., 2014; Crowe, McLeod et al., 2014). However, for multilingual PODC, the advice of friends appears less important (Guiberson, 2013; Steinberg et al., 2003).

The characteristics of a child's deafness have also been reported by parents to be important factors in decisions around communication choices (sign language and/or one or more spoken languages) including age of diagnosis, severity of deafness, type of hearing technology used, and age when starting to use hearing technology (Crowe, Fordham, et al., 2014; Li et al., 2003; Wheeler et al., 2009). Additionally, the type and accessibility of early intervention available, and the age at which intervention commenced can also play a role in decisions around sign and spoken language, including spoken multilingualism (Crowe, McLeod, et al., 2014; Guiberson, 2013).

The family's own communication preference for their deaf child, and their aspirations for their child's future can impact parents' decisions (Crowe, Fordham, et al., 2014; Crowe, McLeod, et al., 2014; Li et al., 2003). The practical need to communicate with family and friends is often cited by PODC (Crowe, Fordham, et al., 2014), including multilingual parents (Steinberg et al., 2003), as well as their own language abilities, including their ability to learn sign language (Crowe, McLeod, et al., 2014; Watson et al., 2008). Planning for their child's future academic and vocational success has additionally been reported as an important factor in the decision-making around monolingual or multilingual spoken language and/or sign language (Crowe, Fordham, et al., 2014; Li et al., 2003). Guiberson (2013) found that parents believed learning two spoken languages would lead to a better education and greater future employment opportunities for their deaf child, whilst some Hispanic parents expressed a preference for their child to learn English, as opposed to their spoken home language, for academic success (Steinberg et al., 2003).

The child's identity is also cited as a factor that parents consider when making communication choices. Parents report that their decision to use spoken and/or sign language with their child was influenced by their desire to facilitate participation in the hearing and/or Deaf community (Borum, 2012; Crowe, Fordham, et al., 2014). Hyde and Punch (2011) found that parents who chose to use sign language with their child did so to support their Deaf identity, while African-American parents in the U.S.A. chose to use spoken language to ensure their child had access to their African oral tradition and identity (Borum, 2012).

FLPs are also flexible and can be modified over time (Revis, 2016). For families of deaf children, a change in FLP regarding the use of one spoken language and/or sign language can be in response to the child's and/or family's emerging or current communication needs, for example, following cochlear implantation (Watson et al., 2008; Wheeler et al., 2009). Additionally, the child's own preference between monolingual spoken language and sign language can drive changes in the FLP (Watson et al., 2008).

Despite the increasing prevalence of d/Deaf multilingual learners, to date this is the first U.K. study exploring the decision-making process around SLM from the parents' perspective. This study also provides a unique comparison of the decision-making process between PODC and parents of hearing children/parent of a hearing child (POHC) who chose to raise their child with multiple spoken languages.

5.2.1. Research questions

- What factors influence parental decisions about raising deaf children with multiple spoken languages?
- What similarities and differences exist in decision-making between parents of multilingual deaf and hearing children?

5.3. Materials and methods

5.3.1. Data collection

This study was given ethical approval by the University of Reading's Research Ethics Committee. All participants gave informed consent prior to participation in the study and pseudonyms were assigned. The study was led by the first author (EW), a doctoral researcher and qualified Speech and Language Therapist with experience of volunteering with deaf children. The second (VS) and third (LS) authors are multilingual academics who specialise in language development in individuals with developmental disorders, and in bi/multilingualism respectively.

5.3.2. Recruitment strategy

Parents were included in the current study if: (1) they had a deaf or hearing child aged between one and 13 years old, with no diagnosed developmental disorders; (2) they spoke a language other than English to their child at home; (3) they and their child’s other parent had typical hearing. The child’s level of proficiency in each language and age of exposure were not used as inclusion or exclusion criteria. Participants were recruited both using purposive and convenience sampling. The children of four PODC and two POHC took part in another research project led by the first author (Wright et al., 2022), whilst the remaining participants were recruited through the researchers’ personal contacts.

5.3.3. Participants

Fifteen participants were recruited. Seven participants were PODC, and eight participants were POHC. For consistency, the multilingual parent was always interviewed, and on one occasion, the other parent was also present. All parents, those interviewed and the children’s other parent, spoke English. The parent interviewed spoke English with a high level of proficiency in addition to one or more of the following languages: Urdu, Persian, French, Dutch, Italian, Russian, German, Romanian, Hungarian, Egyptian Arabic, and Greek. To maintain anonymity, the languages spoken have not been linked to individual participants. Participants' children were aged between 1;7 and 12;3 years-old at the time of interview. All the children were born in the U.K., except for one deaf child and one hearing child. Demographic information is provided in Tables 1 and 2.

Table 1: Demographic information for the deaf children

Interviewee		Age of child at interview (Years; Months)	Child's gender	Number of languages spoken	Degree of deafness	Type of deafness	Age at Diagnosis	Hearing Devices	Age at receiving HAs	Age at receiving CIs
1	Father	10;5	Female	3	Mild-Moderate	Sensorineural	3 months	HAs	5 months	N/A
2	Mother	9;8	Male	2	Severe-Profound	Sensorineural	3 days	CIs	15 days	6 months
3	Mother	8;11	Male	3	Profound (right ear) +	ANSD	3 months	CIs	1 year	18 months (1st implant) +

					Moderate-Severe (left ear)					84 months (2^{nd} implant)
4	Mother	10;2	Male	2	Severe-Profound	Sensorineural	3 months	CIs	3 months	11 months
5	Mother	8;1	Male	2	Profound	Sensorineural	2 months	CIs	2 months	20 months
6	Mother	1;10	Male	3	Severe-Profound	Sensorineural	< 1 month	CIs	2 months	7 months
7	Mother	7;8	Female	2	Profound (right ear) +	Sensorineural	2 months	CIs	3 months	89 months

	Severe- Profound (left ear)	

Note: ANSD = Auditory Neuropathy Spectrum Disorder; HAs = hearing aids (bilateral); CIs = cochlear implants (bilateral)

Table 2: Demographic information for the hearing children

Interviewee		Age of child at interview (Years; Months)	Child's gender	Number of languages spoken
1	Father	8;8	Male	2
2	Mother	8;9	Male	2
3	Mother	9;3	Female	3
4	Mother	4;1	Male	3
5	Mother	3;7	Female	2
6	Mother + Father	1;7	Female	2
7	Mother	12;3	Male	2

5.3.4. Procedure

A semi-structured topic-guided interview (Appendix 2) was conducted in English by the first author (EW) with each parent, focussing on their views on multilingualism and factors that influenced their decision-making process. Additional questions specifically for PODC focussed on the impact of their child's deafness and whether they considered using a signed language. All questions were open-ended and the topic guide was used flexibly, allowing variations in both the order and wording of the questions. Unexpected relevant responses were explored further (Patton, 2002). The interviews took place online, were recorded with the participants' permission, and lasted on average 24 min (15–30 min). In order to protect participant confidentiality, supporting data cannot be made openly available.

5.3.5. Coding and analyses

Interviews were transcribed verbatim, first using an automatic transcription software, and then manually checked for accuracy without making any corrections to the interviewees' English. All identifying information was removed. The interview data were then analysed by the lead researcher (EW) and discussed with the last author (LS) using inductive reflexive thematic analysis (Braun & Clarke, 2019). This type of qualitative analysis was chosen as it is particularly appropriate for investigations of under-researched areas, allowing a data-driven inductive approach instead of being led by pre-existing theories and analytic preconceptions.

Thematic analysis was conducted using the six-stage method by Braun and Clarke (2006). In stage one, after the data was transcribed, it was read and re-read multiple times to allow familiarisation and an initial list of ideas was produced. In stage two, initial codes were generated systematically and data relevant to each code were assigned. Codes were generated using an iterative process; after each new transcript had been coded, the codes assigned to earlier transcripts were continually reviewed and revised. In stage three, the codes were organised into potential themes along with their relevant coded data extracts. In stages four and five, review and refinement of themes took place to ensure the coded data extracts were consistent with their respective themes and to check the validity of the themes with respect to the data set. This process also confirmed that the overall thematic map was reflective of the data set and identified sub-themes from the themes. Themes and sub-themes were acknowledged both if they were relevant to the deaf and hearing group, or if they were only applicable to one group. The themes generated were regularly reviewed by the first and the last author to discuss alternative interpretations until agreement on the definitions and names for each theme had been reached, as recommended by Saldaña (2015). In the final stage, stage six, after the themes were revised and finalised, quotes were selected to represent each theme.

5.4. Results

The thematic analysis generated four themes which captured the factors that influenced the parents' decisions regarding SLM for their child: (1) additional benefits for the child; (2) knowledge and professional advice; (3) family and social influences; and (4) family dynamics and negotiation.

5.4.1. Theme one: Additional benefits for the child

Parents' desire to provide additional benefits for their child through speaking their home language was a running theme throughout the interviews for both the PODC and POHC. Three sub-themes were identified: (1) good language models; (2) culture, identity, and family relationships; and (3) opportunities and advantages.

5.4.1.1. Good language models

Both PODC and POHC frequently discussed how their own language proficiency played an important role in the decisions they made. Their ability to provide better language input to their child in their home language compared to in English was often referenced, as was the importance of providing good language models. One PODC stated, “I can't have the richness of the vocabulary in English as I can have in Italian. So this is one of the most important.” (PODC)

PODC also reflected on their proficiency in BSL in their decision-making process when deciding whether to introduce or continue using BSL with their child. The challenge of learning a new language on top of other commitments was often mentioned, “And um but unfortunately, like our work commitments are you know like the limitation on time it doesn't allow us to learn it ourselves.” (PODC)

5.4.1.2. Culture, identity, and family relationships

Another key factor in parents’ decision-making centred around the importance of the home language in supporting relationships and cultural identity. Being able to communicate with immediate and wider family, and with the home language community, was highly important for both groups. For many families, being able to speak the home language was essential for their child to have a relationship with relatives, in particular grandparents. One parent, who had previously decided to raise their deaf child with only English, cited this as the reason for changing their decision to raise their child multilingually, “Um amongst grandparents on both sides, um they they only speak Urdu so that's why more recently took the decision that he needs to learn a second language.” (PODC)

Sharing their language and culture with their child was also considered very important for parent–child relationships. One PODC discussed the emotional bond that their home language provides with their child and their initial fear of losing this if they spoke English with them, “But I think, like, once your child is born, you're just afraid of losing him um because of language and maybe differences in culture.” (PODC)

Similarly, another PODC reflected on the connection between language and emotion by facilitating a greater level of understanding, “So we wanted them to know our language because it's the language of our heart. So when we want to say something that is very important for us is very important that they understand what we want to say.” (PODC)

Many PODC and POHC also discussed how speaking the home language was an intrinsic part of their child’s cultural identity. An appreciation of the home language’s culture and the sense of belonging that it gave were both mentioned. There was often an acceptance that their children would be more British due to being raised in the U.K.; however, parents in both groups believed there would be a transmission of their culture as well. One PODC explained “Um we thought it's part of her um how can I say that? Um she was born in a Greek family. Both parents are Greek. So it's kind it's kind of your culture as well.” (PODC)

For the PODC, although the majority were not raising their child with BSL, they welcomed and encouraged future engagement with the Deaf community. One parent stated “And also the Deaf community, not using any of like the technologies are very important part of society. So if he can connect with them, we are more than happy for him to learn it.” (PODC)

5.4.1.3. Opportunities and advantages

Parents in both groups believed that being multilingual was very valuable. The benefits discussed were often ones that the parents themselves had experienced and wanted their children to have, for example increased employment opportunities and the ability to travel more easily. Several parents in both groups commented on the advantages their child would have over monolingual children in learning further languages. One PODC explained, "Romanian is quite similar, I would say to Latin language(s) … Italian, Spanish, Romanian. So it's a lot of languages that … would be easy … " (PODC)

Cognitive benefits from speaking more than one language were also frequently mentioned by POHC but less often by PODC. PODC discussed potential advantages in cognition more generally:

I think in general, like it will have a positive impact in his um in his development. So, you know, his brain I mean, I cannot measure it by any scientific measures. Right. So but I truly believe that probably it will have some positive impact … (PODC)

POHC however, frequently referenced increased cognitive flexibility and the positive impact this can have on other skills. For example, one POHC said "The cognitive, not fluidity, but you know essentially your brain becomes more flexible in processing things. Not not just languages, but, you know, things like mathematics as well." (POHC)

5.4.2. Theme two: Knowledge and professional advice

This theme was particularly significant in the decision-making process for PODC. Three sub-themes were identified: (1) parents' knowledge; (2) nature of professional input; and (3) impact and influence of professional input.

5.4.2.1. Parents' knowledge

PODC mentioned feelings of uncertainty and anxiety around their child's diagnosis. Parents stressed that their concerns centred around deafness and not multilingualism itself when it came to making communication choices, citing their lack of existing knowledge on deafness and potential language outcomes. One PODC stated:

So we had concern because um we were very new to deafness. We had no idea. Like I I have barely seen even hearing aids in my life, let alone cochlear implant, if it makes sense. … I thought that's like a deaf person can never talk. (PODC)

Both groups of parents reported doing independent research as part of their decision-making, but PODC commented on a lack of available information on SLM in deaf children, especially in an accessible format. For instance, one PODC said "And the resources I think the the resources from the hearing journal are fantastic, but they are very technical sometimes. But parents at that time, they are not very technical." (PODC)

5.4.2.2. Nature of professional input

For POHC professional advice was rarely discussed within the context of their language choices. When mentioned, it was reported that it was either absent or the home language was supported. In contrast, professional input, from professionals working in deafness, was discussed by all PODC, although the nature of the advice received varied greatly.

Some parents reported that professionals were interested in SLM for deaf children, stressed the importance of good language models, and supported the use of the home language. For one PODC the positive advice from professionals meant they did not reconsider their decision to raise their child multilingually, " … when we met the doctors, the also the surgeon, also their AVT (Auditory Verbal Therapist) our therapist, they told us, no, you have to keep on talk your language. So we never thought about this." (PODC)

Another PODC reflected on how their child's Teacher of the Deaf had actively encouraged maintenance of the home language even when their child had started school:

When though I said to her teacher of the deaf that lately I'm focussing more on English vocabulary so that she will improve and reach, let's say, her English vocabulary she said, that's amazing. Thank you so much. But definitely don't forget um her Greek as well. (PODC)

However, other PODC reported less positive professional advice, with professionals doubting the feasibility of and cautioning against using multiple spoken languages, advising one language for faster progress. For example, one PODC said " … it was mainly English right from the outset because that was the advice the medical professionals provided us to help his um development in his language. Just to use English." (PODC)

Regarding BSL, professional advice was often less positive. Several PODC were told it can negatively affect spoken language development and were advised against using it with their child. One PODC stated " … the therapist told us for the sign language … the more you use like the sign language, the less they will increase their (spoken) vocabulary." (PODC)

5.4.2.3. Impact and influence of professional input

The effect professional advice had on parents' decision-making differed greatly between the PODC and POHC. While POHC either did not seek professional advice and/or were unsure if it had influenced their decisions, PODC greatly valued professional advice and placed a high level of trust in their recommendations. For instance, one PODC said "But we were absolutely convinced that for me, the the most important person are the professionals. You know, the professionals are the people that know everything. So I trusted what they told me.” (PODC)

For one PODC, the professional advice they received resulted in them temporarily changing their FLP when their child was around three years old to focus on English:

But I don't think there was a lot of encouraging or like very um, very uplifting advice, let's say, to to go with just, with two languages. I always used to hear was, well, you'll see a lot more progress if you stick to one language and then um if you do two then it will be slower, but then they will acquire both in the end. Um yeah so we carried on (only) in English until then he started pre-school. (PODC)

The challenges of receiving impartial and conflicting advice from professionals, and how this led to increased uncertainty were also discussed by PODC. One PODC stated “We had a lot of fears, anxiety. It's a very tough journey, especially in the beginning. So um and then having, like, conflicting advice from the professionals was like even it was making it even more challenging … ” (PODC)

One PODC, while acknowledging that professionals encouraged them to do what felt natural, reflected on how the impartial professional advice also led to them reconsidering their FLP, “It just made me unsecure. … And harder to decide. I kind of had my mind up, but then you feel like … maybe I shouldn't do that.” (PODC)

The role of different professionals was also discussed by one PODC who perceived professionals in audiology to offer purely medical support as opposed to advice on language choices, “But that's much more medical about her audiogram and whether what's the latest models of hearing aids are that she can get. But not not, we didn't really discuss multilingualism.” (PODC)

Another PODC reflected on how professionals delivered information and how this can be achieved positively whilst giving measured advice:

Then there was this um, a teacher of the deaf who was in the cochlear implant centre. … But she was very supportive, she was like I'm sure like you know he will pick up like the words and um if he doesn't, it's not the end of the world. So, you know, she was not giving us any false like information or any um any hope that that he cannot achieve. She was giving us, like, encouragement. I think it's very important to encourage people, but also nice to remind them that it might not happen. (PODC)

5.4.3. Theme three: Family and social influences

This theme was relevant for both PODC and POHC. We identified three sub-themes: (1) advice from family and friends; (2) advice from other parents; and (3) wider social influences.

5.4.3.1. Advice from family and friends

Both groups of parents reported that family and friends supported their decisions. Advice to POHC was inconsistent with some insisting on the home language, advising one language only, or not giving advice at all. However, for PODC advice was always absent. One parent explained that this was because the home language was expected by family members:

Um not really. I mean, all of them, because we're from sort of Pakistani backgrounds and stuff, all of our children have some element also whether they can speak it. … So it's it's almost a norm that happens within the family. (PODC)

Another parent believed the absence of advice from family was due to their lack of knowledge on deafness, “No, never. We never had because our family didn't know anything about hearing loss. So they were absolutely, they were they trusted us completely. They didn't know." (PODC)

5.4.3.2. Advice from other parents

For both PODC and POHC, hearing the experiences of other parents who raised their deaf and hearing children with multiple spoken languages was very important. For PODC, whilst many expressed a desire to speak to other multilingual PODC, very few were able to, but those that did greatly valued the opportunity. One parent stated:

I would say we were very lucky because our audiologist presented us other families, Jewish families for example in the US, there are many Jewish families with deaf children. And they were speaking their language and English. And they told us immediately, absolutely speak both languages. (PODC)

5.4.3.3. Wider social influences

Online parent forums, particularly through Facebook, were used by both groups of parents to connect with other families raising their children multilingually. These included international groups specifically for PODC, that gave parents encouragement to choose SLM. For instance, one parent said "I think most of it was like from from the forums. … that has people across the world … I think there was people from Canada that do French and English anyway or is very normal anyway." (PODC)

Plans to return to their home country were also cited by one PODC as a key reason for speaking to their child in their home language, "We kept saying our plan was to go back to Romania, so we were focussing and always saying, oh, he will need to speak Romanian." (PODC)

5.4.4. Theme four: Family dynamics and negotiation

Both PODC and POHC discussed how their FLPs were influenced by factors within the family which also resulted in changes being made over time. Three sub-themes were identified: (1) planning; (2) flexibility in FLP; and (3) time commitment.

5.4.4.1. Planning

PODC and POHC commented on how raising their child with English and their home language(s) was a natural decision and often one that had been made before their child's birth. However, for PODC, following their child's diagnosis there was sometimes a period of re-evaluation and/or a revision in their FLP to temporarily prioritise English in preparation for their child starting school. One parent stated:

Then we sort of switched or introduced English as he started um going to school here. And then later on, when I felt that English was maybe taking over, it was, he needed it (home language) to communicate to his grandparents. (PODC)

5.4.4.2. Flexibility in FLP

Both PODC and POHC were open to changing their FLP in the future and for PODC occasionally a child's parents' beliefs differed. For example, one PODC said:

I just decided let's see. Let's see what's going to happen. If he if he struggle at some point, yes which make we can change our decision and anyway at some point. But and I think it for my husband, it wasn't just only that time, it has been for a couple of times that he was telling me that we have to drop Russian and we have to concentrate more on English. (PODC)

Another PODC discussed how their family's FLP changed to include BSL, in response to their child's language needs:

But we were advised at the beginning by a, her teacher of the deaf that it's better not to make her rely more on sign language … So, um yeah, that's why I didn't learn earlier. But later on when I saw that in some parts of her life, she would like to sign, for example, when she had her hearing aids off and she was in a swimming pool, then I had to sign to her if she needed something. … Or when now she has her cochlear implants off when she goes to bed or when she's having a bath then of course we can communicate with sign language. So, yeah, we use it. (PODC)

5.4.4.3. Time commitment

For PODC, the time involved to learn and teach their child BSL was often a reason why they did not include the language in their FLP. One PODC expressed a sense of urgency to expose their child to language and that these perceived time pressures, often influenced by professional advice, contributed to their decision that they did not have the time to learn and use BSL:

So because we didn't know the sign language and we decided to use to have the cochlear, we never learnt about this. We don't there, in the future if they would like to learn it, but we don't know any sign language so for us it was more difficult you know. We didn't have the time even because they the the surgeon tell you you have the time is gold, do faster, don't lose time. So any time we had to learn another language would be too much. (PODC)

5.5. Discussion

This study explored the decision-making process around the communication choices of multilingual PODC and how it compares to multilingual POHC. PODC and POHC shared many of the same factors within the family that influenced the decisions they made including their desire to give their child additional benefits by providing good language models, offering future opportunities, and supporting access to their culture and wider family relationships. Regarding factors outside the immediate family, while advice from wider family and friends was less influential for both groups, professional advice was considerably more significant for PODC. Here, we focus on two of the most influential factors for PODC: the importance of the home language in transmission of culture, identity and relationships, and the impact of the professional advice they received.

The role the home language plays in a child's culture, identity, and relationships with family members had a significant impact on parents' decision-making. Both groups of parents emphasised how the home language gave their child access to their heritage culture, supporting their bicultural identity. Similar findings in the U.S.A. were reported by Borum (2012) where African-American parents chose to use spoken language instead of sign language with their child to share their African oral tradition and identity. Likewise, Crowe, Fordham et al. (2014) found that transmission of their cultural heritage was important for some deaf Maltese families living in Australia. Consistent with previous studies (Crowe, Fordham, et al., 2014; Steinberg et al., 2003), proficiency in the home language was reported as crucial for successful bonding with their deaf child, and in some cases, essential in enabling relationships within their wider family. Our findings are also supported by research on multilingualism and family well-being in hearing populations. Positive associations with the home language's culture and bicultural identities have a beneficial impact on young people's self-esteem and well-being (Gonzales-

Backen et al., 2017; Müller et al., 2020; Vuorenkoski et al., 2000), while adolescents who speak their parents' native language have higher levels of family cohesion than those who only speak the country's main language (Tseng & Fuligni, 2000).

For PODC, professional advice played a major role in their decision-making in providing information and influencing the decisions they ultimately made, in line with previous studies (Crowe, Fordham, et al., 2014; Crowe, McLeod, et al., 2014; Decker et al., 2012), including those focusing on multilingual parents (Steinberg et al., 2003). Earlier research in the U.S.A. found that multilingual parents often report being advised by professionals to speak only English with their deaf child (Guiberson, 2005; McConkey Robbins et al., 2004; Steinberg et al., 2003; Waltzman et al., 2003). However, more recent studies in the U.K. and Australia have reported that professionals support and encourage the use of the child's home language (Crowe & Guiberson, 2021; Crowe & McLeod, 2016; Wright et al., 2022). Our findings are mixed; some PODC reported that they were advised to use their home language, while others said they were advised to use only English or did not receive definitive advice either way. The high level of trust and value that PODC placed in professionals resulted in them following their advice, even if it went against their desire to speak their home language, similar to Steinberg et al.'s (2003) findings on Spanish-speaking parents in the U.S.A.

The International Consensus statement on best practices in family-centred intervention for deaf children states that professionals must "promote linguistic accessibility and home languages" (Moeller et al., 2013, p. 437), by providing relevant and timely information to parents (Moeller et al., 2013). However, the limited research available on language outcomes in deaf children with SLM presents a challenge in providing evidence-based advice (Crowe & Guiberson, 2021). This may explain why some parents reported that professionals were reluctant to give definitive advice, or why they received inconsistent advice from different professionals. For PODC in the present study, this impartial and conflicting advice intensified their uncertainty and anxiety around their child's deafness and its impact on SLM.

These findings highlight that the model of clinical decision-making used by professionals when supporting multilingual PODC in their language choices needs to be carefully considered. A greater level of involvement from professionals is likely to be appreciated by multilingual PODC, especially due to the lack of accessible information on SLM in deafness, and limited opportunities for parent-to-parent support. Shared decision-making where "clinicians and patients share the best available evidence when faced with the task of making decisions, and where patients are supported to consider options, to achieve informed preferences" (Elwyn et al., 2012, p. 1361) may therefore be more appropriate than informed choice where professionals provide information and parents complete the decision-making independently (Porter et al., 2018). Professionals should actively support parents to consider the benefits and compromises of using or not using their home language with their deaf child with respect to their values and preferences whilst sharing the available research. This will enable parents to feel supported in making informed decisions whilst also taking into consideration their own wishes and desires for their child and their future.

5.5.1. Future directions and limitations

This is the first U.K. study which explores the decision-making process around communication choice for PODC from multilingual backgrounds compared to the experiences of POHC who also chose to raise their child with SLM. There are limitations though which provide opportunities for future research. Firstly, the interviews were in English which resulted in only parents proficient in English being recruited and participating. Secondly, the retrospective nature of the study may have impacted the results, as most of the children were primary-school aged, and the professional advice that parents received may not reflect current guidance given.

Lastly, future research could further explore the experiences of multilingual PODC who chose to only use English, with or without sign language, and/or who have deaf children with additional disabilities. The perspective of deaf children with SLM could also be explored further in the interest of exploring children's agency in FLP.

5.6. Conclusions

The FLPs that multilingual PODC construct are influenced by a wide range of factors. Similar to multilingual POHC, the language choices that multilingual PODC make are greatly influenced by their desire to give their child the additional benefits that speaking the home language brings: providing rich language models, supporting their child's cultural identity and relationships, and facilitating future opportunities. However, in contrast to POHC, PODC also place a considerable amount of trust and value in professionals and the advice they give. The results of this study will provide professionals who work with deaf children an increased acknowledgement and understanding of FLPs by multilingual PODC and the impact that their advice can have. This will in turn help them to consider how they can best support parents to make informed decisions. This study also enables multilingual PODC to hear about the decision-making process around communication choice from other PODC who chose SLM.

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Chapter 6: Language, theory of mind, and executive function skills in deaf children with spoken language multilingualism

Chapters 4 and 5 showed the significant role that professionals play in parental decision-making around SLM for deaf children. However, previous research has reported that professionals find it challenging to provide evidence-based advice due to limited research on outcomes for deaf children with SLM (Crowe & Guiberson, 2021). This chapter presents a study on the language and cognitive abilities of deaf children with SLM, compared to oral monolingual deaf children, monolingual hearing children and multilingual hearing children. Specifically, this study tested English language abilities in expressive vocabulary and morphosyntax, as well as informally assessing the multilingual deaf and hearing children's home language(s). Cognitive abilities focused on executive function and Theory of Mind.

Wright, E., Stojanovik, V., & Serratrice, L. (submitted December 2022). *Deafness & Education International*

Statement of Author Contribution

In the chapter entitled "Language, theory of mind, and executive function skills in deaf children with spoken language multilingualism", the authors agree to the following contributions:

Emily Wright – 70% (Experimental design, data collection, data analysis and writing)

Signed: Date: 8.12.2022

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6.1 Abstract

Increasing numbers of deaf children around the world use multiple spoken languages, with or without a signed language(s) as well. A complex relationship exists between language ability, executive function (EF), and Theory of Mind (ToM), and deaf children can be at risk of difficulties in all three areas of development. Research on language outcomes in children with spoken language multilingualism (SLM) is highly varied, and the development of EF and ToM in this population has not yet been explored. This study examined the language and cognitive (EF and ToM) abilities of five deaf children with SLM compared to five deaf oral monolingual children, five hearing multilingual children and five hearing monolingual children. The children were matched as closely as possible on demographic factors (including age, gender and parental education), as well as on their audiological profile for the deaf children (including age of diagnosis, type/degree of deafness and type of technology used). English language abilities in expressive vocabulary and morphosyntax were tested, and the multilingual deaf and hearing children's home language(s) was also indirectly assessed using parental reports. Results showed that deaf children with SLM performed in the same range as the other three groups on both the measures of EF and ToM, and morphosyntactic abilities in English. Expressive vocabulary skills in English were lowest for the deaf children with SLM; however, three out of five children scored above average compared to monolingual test norms. Parental ratings of the children's home language skills were also very similar for the multilingual deaf and hearing children. Deaf children with SLM can achieve linguistic competency in at least two spoken languages and develop EF and ToM abilities in line with their hearing peers. Professionals should therefore not discourage multilingual parents from raising their deaf child with multiple spoken languages.

6.2. Introduction

There are increasing numbers of d/Deaf multilingual learners around the world who use multiple spoken languages, with or without a signed language(s) as well. We use the term "spoken language multilingualism (SLM)" to refer to any individual who can produce or comprehend two or more spoken languages (with or without a signed language as well), "regardless of the level of proficiency, use, and the age at which the languages were learned" (Grech & McLeod, 2012, p. 121). In this paper, when referring to D/deaf individuals, the term "Deaf" will be used to refer to individuals who identify as members of the signing Deaf community, while the term "deaf" will be used to refer to individuals who do not identify as members of the signing Deaf community.

A complex relationship exists between language ability, executive function (EF), and Theory of Mind (ToM), and deaf children from hearing families can be at risk of difficulties in all three areas of development (Botting et al., 2017; Ruben, 2018; Schick et al., 2007). There is limited research on language outcomes for deaf children with SLM and currently no research exists (to the best of our knowledge) on EF and ToM development in this specific population. It is important that language, EF and ToM abilities are explored in deaf children with SLM due to the strong interaction between all three areas of development and the impact they can have on a child's socio-emotional skills, academic achievement and quality of life (e.g., Cortés Pascual et al., 2019; Haukedal et al., 2018; Smit et al., 2019).

6.2.1. Language

Age-appropriate spoken language skills are now achievable for deaf children (Nicholas & Geers, 2007); however, great individual variability still exists (Niparko et al., 2010). Deaf children with SLM have also been found to have a high degree of variability in language outcomes (Crowe, 2018). Several studies have reported that SLM does not negatively affect language outcomes in deaf children and proficiency in two or more languages can be achieved

(Bunta et al., 2016; Bunta & Douglas, 2013; Guiberson, 2014; Francis & Ho, 2003; McConkey Robbins et al., 2004; Thomas et al., 2008; Waltzman et al., 2003). However, other studies have reported poorer language outcomes in deaf children with SLM compared to deaf oral monolingual children (Deriaz et al., 2014; Forli et al., 2018; Keilmann et al., 2019; Teschendorf et al., 2011). The variation in language outcomes for deaf children with SLM has been attributed to several factors including the quantity and diversity of input in each language (Teschendorf et al., 2011; Waltzman et al., 2003; Yim, 2012), duration of cochlear implantation (Yim, 2012), the parents' own level of proficiency in the country's majority language and the family's social integration (Forli et al., 2018; Teschendorf et al., 2011), and whether intervention is delivered in one or both languages (Bunta et al., 2016).

6.2.2. Executive function (EF)

Deaf children from hearing families are often reported to be at risk for reduced or clinically significant difficulties in EF (Botting et al., 2017; Kronenberger et al., 2014). EF is an umbrella term that represents a complex set of cognitive processes that emerge in early infancy and continue to develop into adolescence (Buttelmann & Karbach, 2017) including: inhibition; working memory; planning; flexibility; organization and attention. These cognitive control and self-regulatory processes are crucial for goal-orientated and situation-orientated actions (Blair, 2016).

EF abilities in children can be assessed using an experimental approach or through behaviour rating inventories completed by parents, teachers, or the children themselves. The Behaviour Rating Inventory of Executive Function (BRIEF) (Gioia et al., 2000) is a widely used and well-validated tool for assessing EF abilities in children aged five to 18 years old in real-world contexts. To date, no research has been carried out on EF in deaf children with SLM, using either experimental approaches or behaviour rating inventories. However, studies have used the BRIEF to assess EF skills in oral monolingual deaf children, with many documenting

EF difficulties including in inhibition, working memory, monitoring, shifting and initiation (e.g., Beer et al., 2011; Hintermair, 2013; Kronenberger et al., 2014).

A complex relationship exists between hearing, language, and EF, and there is no scientific consensus on the causal nature of EF difficulties in deaf children. Two accounts have been proposed to explain why deaf children are at risk, the auditory access account, and the language access account. The auditory access account argues that hearing deprivation directly leads to EF difficulties (Kral et al., 2016), whilst the language access account argues poor EF skills are a result of language deprivation (sign or spoken) (Goodwin et al., 2022; Hall et al., 2018).

Several studies have also used the BRIEF to assess the underlying cause of EF problems in deaf children by including Deaf children who are native signers, and who have therefore not experienced a period of limited language exposure. Findings have been consistent with the hypothesis that language access (speech or sign) is critical for EF development, not auditory access, with Deaf native signers performing similarly to their hearing peers (Hall et al., 2017; Hall et al., 2018; Goodwin et al., 2022).

6.2.3. Theory of Mind (ToM)

Deaf children from hearing families are also often reported to be at risk of delays in the acquisition of ToM (Schick et al., 2007). ToM is essential for successful social interaction and communication, by enabling individuals to understand the mental states of others (e.g. beliefs, desires and intentions) and realise that they can be different from their own (Premack and Woodruff 1978).

Similar to what has been reported for EF, Deaf children who are native signers have shown significantly better performance on ToM tasks compared to deaf children from hearing families and comparable abilities to typically developing (TD) hearing children (Schick et al., 2007). This contrast in ToM performance has been attributed to differences in their linguistic environments. Caregiver mental-state talk and children's language abilities at three years old have both been found to influence ToM performance at five years old (Moeller & Schick, 2006; Walker et al., 2017).

Whilst Deaf children who are native signers experience linguistically rich environments, deaf children from hearing families (oral or late signers) often experience a period of limited language exposure. As a result, deaf children from hearing families are often exposed to less "mentalistic" conversation (including sharing thoughts and feelings) (Morgan et al., 2014) which can have an impact on their knowledge (receptive and productive) of both the vocabulary (e.g. "believe" or "know") and syntax (e.g. sentential complements) needed to discuss mental states. In addition, despite early cochlear implantation, spoken language development can still be delayed compared to hearing children (Duchesne & Marschark, 2019).

Research suggests that in bilingual children with typical hearing, ToM abilities are enhanced compared to age-matched monolingual hearing children (for a meta-analysis see Schroeder, 2018). These advantages have often been attributed to better EF performance, in particular inhibitory control which enables children to inhibit their own belief or knowledge in order to focus on someone else's (Carlson et al., 2002). However, linguistic factors, including metalinguistic awareness and sociolinguistic sensitivity, have been proposed as an alternative explanation (Díaz, 2021). Bilingual children frequently encounter individuals with differing linguistic knowledge; as a result, their ability to identify and repair breakdowns in communication is greater (Wermelinger et al., 2017) and they demonstrate increased perspective taking skills (Liberman et al., 2017). No research has been conducted on EF or ToM in deaf children with SLM; consequently, the relationship between language, EF and ToM in this specific multilingual population has not yet been established.

6.2.4. The present study

This study provides an overview of language, EF and ToM abilities in deaf children with SLM. To explore the impact of deafness and SLM on language and cognitive development, three comparison groups have been included: deaf oral monolingual children, hearing multilingual children and hearing monolingual children.

6.2.5. Research Questions

RQ1: How do the English spoken language abilities (vocabulary and morphosyntax) of deaf children with SLM compare to those of age-matched deaf oral monolingual children, hearing multilingual children, and hearing monolingual children?

RQ2: How do parents of deaf children with SLM rate their children's knowledge and use of their home language compared with parents of hearing multilingual children?

RQ3: How does EF and ToM development in deaf children with SLM compare with age-matched deaf oral monolingual children, hearing multilingual children and hearing monolingual children?

6.3. Materials and methods

6.3.1. Participants

Twenty children in four groups participated in this UK-based study: (group 1) deaf children with SLM; (group 2) deaf oral monolingual children; (group 3) hearing multilingual children and (group 4) hearing monolingual children. All children were aged between seven and ten years old, had received at least two years of education in the UK and had parents with typical hearing. Almost all the children's parents had completed a university degree to at least undergraduate level. All the deaf children used spoken language as their primary mode of communication, and none used British Sign Language (BSL). All but one of the deaf children had received Auditory Verbal Therapy (AVT).

Participants in each group are numbered one to five and are matched as closely as possible with the corresponding participant number in the other three groups based on demographic factors and their audiological profile. For example, participant 1 from the deaf SLM group is closely matched to participant 1 from the three other groups. Demographic factors included: gender, chronological age, and parental education. Audiological factors included: type/degree of deafness, age of diagnosis, age when they received hearing technology, type of hearing technology, and whether they attended AVT. Only TD children with a non-verbal scaled IQ-score of seven or greater on the Matrix Reasoning subtest of the Wechsler Intelligence Scale for Children, Fourth UK Edition (WISC-IV UK) (Wechsler, 2003) were included; however, children were not matched based on their non-verbal IQ. See Table 1 for detailed demographic information and Table 2 for audiological information.

Table 1: Demographic participant information

Group	Participant	Gender	Age at session 1 (Years; months)	Age at session 2 (Years; months)	Age at session 3 (Years; months)	Number of languages spoken
Deaf SLM	1	Male	7;7	7;7	7;7	2
	2	Male	9;1	9;2	9;2	2
	3	Male	9;1	9;2	9;2	2
	4	Male	9;6	9;7	9;7	2
	5	Female	9;9	9;9	9;10	3
Deaf Oral Monolingual	1	Male	7;1	7;1	7;2	1
	2	Male	8;9	8;9	8;10	1
	3	Male	10;1	10;2	10;2	1
	4	Male	10;6	10;6	10;6	1
	5	Female	9;8	9;8	9;8	1
Hearing Multilingual	1	Male	7;5	7;5	7;5	2
	2	Male	8;7	8;7	8;7	2
	3	Male	8;7	8;7	8;7	2
	4	Male	9;0	9;0	9;0	2
	5	Female	9;3	9;3	9;3	2
Hearing Monolingual	1	Male	7;8	7;8	7;9	1
	2	Male	8;9	8;10	8;10	1
	3	Male	9;8	9;8	9;8	1
	4	Male	9;9	9;9	9;9	1
	5	Female	10;0	10;0	10;1	1

Table 2: Audiological participant information

Group	Participant	Deafness type/degree – right ear	Deafness type/degree – left ear	Age deafness diagnosed	Age received hearing aids	Age received cochlear implants	Attended Auditory Verbal Therapy	Type of school attended
Deaf SLM	1	Profound sensorineural	Profound sensorineural	2 months	2 months	≤ 24 months	No	Mainstream with a specialist unit for deaf children
	2	Severe to profound sensorineural	Severe to profound sensorineural	≤ 1 week	≤ 1 month	≤ 12 months	Yes	Mainstream
	3	Severe to profound sensorineural	Severe to profound sensorineural	≤ 1 week	≤ 1 month	≤ 12 months	Yes	Mainstream
	4	Severe to profound sensorineural	Severe to profound sensorineural	3 months	3 months	≤ 12 months	Yes	Mainstream
	5	Mild to moderate sensorineural	Mild to moderate sensorineural	3 months	5 months	N/A	Yes	Mainstream

Deaf Oral Monolingual	1	Profound sensorineural	Profound sensorineural	2 months	3 months	≤ 24 months	Yes	Mainstream
	2	Profound sensorineural	Profound sensorineural	≤ 1 month	≤ 1 month	≤ 18 months	Yes	Mainstream
	3	Profound Auditory Neuropathy Spectrum Disorder	Profound Auditory Neuropathy Spectrum Disorder	≤ 1 month	3 months	≤ 12 months	Yes	Mainstream
	4	Profound sensorineural	Profound sensorineural	≤ 1 month	≤ 1 month	≤ 12 months	Yes	Mainstream
	5	Moderate sensorineural	Moderate sensorineural	≤ 1 week	≤ 1 month	N/A	Yes	Mainstream

Deaf and hearing children with SLM were eligible for inclusion if at least one of their parents communicated with them using a spoken language other than English. Home languages spoken included: Dutch, French, German, Greek, Italian, Romanian, Russian, and Tamil. Languages spoken have not been matched to individual participants to maintain anonymity. A language history questionnaire (Appendix 3) (Serratrice, & De Cat, 2020) was completed by their parents; the summarised data can be found in Tables 3, 4 and 5.

Table 3: Language background participant information – parents' proficiency and language use with child

Group	Participant	Age arrived in UK if not born here	Language spoken by Parent 1 to child	Parent 1 self-rating of spoken English proficiency	Language child speaks to Parent 1	Language spoken by Parent 2 to child	Parent 2's spoken English proficiency rated by Parent 1	Language child speaks to Parent 2
Deaf SLM	1	N/A	Home language – always English - rarely	Quite well	Home language – always English - rarely	Home language – always English - never	Not well	Home language – always English - never
	2	1 year old	Home language – usually English - rarely	Quite well	Home language – half the time English – always	Home language – usually English – half the time	Very well	Home language – half the time English – always
	3	1 year old	Home language – usually English - half the time	Quite well	Home language – half the time	Home language – usually	Very well	Home language – half the time

					English – always	English – half the time		English - usually
	4	N/A	Home language – half the time English – usually	Very well	Home language – half the time English – usually	Home language – half the time English – half the time	Quite well	Home language – half the time English – usually
	5	N/A	Home language – half the time Second home language - rarely English – half the time	Very well	Home language – rarely Second home language - rarely English – usually	Home language – always Second home language - never English – always	Very well	Home language – always Second home language - never English – always
Hearing Multilingual	1	N/A	Home language – usually English - rarely	Very well	Home language – half the time	Home language – rarely	Very well	Home language – rarely

				English – half the time	English - usually		English - usually
2	3 years old	Home language – usually English - rarely	Very well	Home language – half the time English – half the time	Home language – rarely English - always	Very well	Home language – rarely English - always
3	N/A	Home language – usually English - rarely	Very well	Home language – half the time English – usually	Home language – always English - rarely	Very well	Home language – half the time English – usually
4	N/A	Home language – usually English - usually	Quite well	Home language – half the time English – usually	Home language – usually English - usually	Quite well	Home language – usually English - usually
5	N/A	Home language – half the time English – half the time	Quite well	Home language – half the time	Home language – rarely	Quite well	Home language – rarely

	English – half the time	English usually	-		English always	-

Key: Self-rating of spoken English proficiency: very well; quite well; not well; not at all

Self-rating of language spoken from parent/child to child/parent: always; usually; half the time; rarely; never; not applicable

Table 4: Language background participant information – language exposure and use

Group	Participant	Age child first exposed to English regularly	Where child was first exposed to English regularly	Was the child the parents' first child	Language used with siblings (if applicable)	Weeks per year spent home language country	How often child speaks English during the holidays
Deaf SLM	1	2-3 years old	Nursery	Yes	Home language	3 weeks	Rarely
	2	0-1 years old	Nursery	No	English	3 weeks	Always
	3	0-1 years old	Nursery	No	English	3 weeks	Always
	4	3-4 years old	Nursery	Yes	English	8 weeks	Half the time
	5	0-1 years old	Home	Yes	English	3 weeks	Usually
Hearing Multilingual	1	0-1 years old	Home	Yes	English + (rarely) Home language	2 weeks	Rarely
	2	0-1 years old	Home	Yes	Home language + English	3 weeks	Half the time
	3	2-3 years old	Nursery	Yes	English	5-6 weeks	Half the time
	4	0-1 years old	Home	No	English	3-4 weeks every two years	Always

5	2-3 years	Nursery	Yes	Home language + English	5 weeks	Rarely

Table 5: Language background participant information – activities in the home language

Group	Participant	Reading with an adult	Using the computer	Watching TV	Sports	Playing with other children
Deaf SLM	1	Yes	No	Yes	No	No
	2	Yes	Yes	No	Yes	No
	3	Yes	No	No	Yes	No
	4	No	No	Yes	No	Yes
	5	Yes	No	Yes	No	Yes
Hearing Multilingual	1	Yes	No	Yes	No	Yes
	2	Yes	Yes	Yes	No	Yes
	3	Yes	Yes	No	No	Yes
	4	No	No	No	No	No
	5	Yes	No	Yes	No	No

6.3.2. Recruitment of participants

Ethical approval was given by the University of Reading's Research Ethics Committee. Recruitment of the deaf children was achieved by establishing contact with parents via UK charities including: the National Deaf Children's Society (NDCS); Auditory Verbal UK (AVUK); Cochlear Implanted Children's Support Group (CICS), and Deaf Education through Listening and Talking (DELTA). The hearing children were recruited by advertising the study through the University of Reading and through personal contacts. Informed written consent was obtained from the children's parents and verbal assent was obtained from the children before testing commenced. Twenty-five children were recruited in total; however, five children had to be excluded. Three deaf children and one hearing child were excluded from the study as they achieved a scaled score less than seven on the Matrix Reasoning subtest of the WISC-IV UK and/or their internet connection was not strong enough to obtain accurate data recordings. Another monolingual hearing child was not included as she was not a match for the deaf children.

6.3.3. Data collection

Data collection was conducted online between August 2020 and August 2022. The children completed the assessments individually via video calls in their home across three sessions using Microsoft Teams or Zoom. The order of the tasks was the same for all participants. The data will be eventually archived on the UK Data Service ReShare (https://reshare.ukdataservice.ac.uk).

6.3.4. Test Materials

6.3.4.1. Baseline measure

The Matrix Reasoning subtest of the WISC-IV UK was used as a baseline measure of the children's non-verbal cognitive abilities.

6.3.4.2. Expressive vocabulary

The Expressive One-Word Picture Vocabulary Test, 4th Edition (EOWPVT-4) (Martin & Brownell, 2011) was used to assess single word vocabulary production. As the EOWPVT was developed in the USA, following Jones et al.'s (2019) study, two substitutions and one exclusion were made to ensure the assessment was appropriate for children in the UK. The picture of a racoon was replaced with a badger and the existing picture of a windmill was replaced with another picture of a windmill more representative of those seen in the U.K. The noun "prescription" was also excluded (credit was given for this item if participants went passed this point in the test). Additionally, the words "post" and "spanner" were accepted for the target words "mail" and "wrench" respectively. Percentiles have been given to represent the children's abilities compared to the general hearing monolingual population.

6.3.4.3. Sentence repetition task

The LITMUS sentence repetition task (LITMUS-SRep task) (Marinis & Armon-Lotem, 2015) was used to assess the children's morphosyntactic abilities. The task comprises 30 sentences in English, with differing levels of grammatical complexity. The task was originally designed to run on a computer with pre-recorded sentences; however, to allow the deaf children to lip-read, all the children listened to the sentences spoken by the experimenter. None of the children used headphones. The children's repetitions were audio-recorded and transcribed and scored offline.

The LITMUS-SRep task can be scored in four different ways; for the purpose of this study whole sentence scoring and syntactic structure scoring were chosen. For whole sentence scoring, a child receives a score of one if the sentence is repeated entirely correctly and zero if there are one or more errors. For syntactic structure scoring, a score of one is given if the child reproduces the target syntactic structure correctly, regardless of whether they make a lexical error or substitution/omission which does not change the structure. A score of zero is given if there is an error in the repetition of the targeted sentence structure or if the child produces a syntactic structure other than the target.

6.3.4.4. Theory of Mind

The Theory of Mind Task Battery (ToMTB) (Hutchins & Prelock, 2010) was used to measure ToM. The ToMTB, is a direct assessment of ToM developed for children aged two to 13 with good test–retest reliability (Hutchins et al., 2008). The assessment comprises nine tasks with a total of 15 test questions that cover the three developmental stages of ToM (Early, Basic and Advanced). The tasks are presented in a story-book format and assess emotion recognition, desire-based emotion, seeing leads to knowing, line of sight, perception-based action, standard false belief, belief- and reality-based emotion and second order emotion, message-desire discrepancy, and second-order false belief.

For each question, a response can be provided verbally or non-verbally by pointing to the correct picture and a score of one for a correct answer or zero for an incorrect answer is given. A maximum score of five can be achieved for each developmental stage (Early, Basic, and Advanced) with a possible total score of 15. The Early subscale is designed to capture ToM abilities that emerge in typical development between one and three years of age, the Basic subscale between three and a half and five and a half years of age and the Advanced subscale between five and a half and eight years of age. Justification questions are available for 10 of the 15 test questions, each with a possible score of one to three, and a total score out of 30.

6.3.4.5. Executive function behaviours

The BRIEF parent report questionnaire (Gioia et al., 2000) was used to assess EF behaviours in everyday life. The BRIEF Parent Form includes 86 items that measure different aspects of EF across eight clinical subscales. The clinical scales form two broader indexes; three of the subscales (Inhibit, Shift, Initiate) form the Behavior Regulation Index (BRI) while the other five subscales (Emotional Control, Working Memory, Planning/Organization, Organization of Materials, Monitor) form the Metacognition Index (MI). An overall score, the Global Executive Composite (GEC) is calculated by combining the BRI and the MI.

Raw scores for the BRI, MI and GEC are converted into T-scores based on a normative sample of TD hearing children, with higher T-scores corresponding to greater executive difficulties and/or delays. T scores have a mean of 50 and standard deviation (SD) of 10, with scores ≥60 considered elevated, and ≥65 considered clinically significant.

6.3.4.6. Assessment of home language

An adapted version of the Student Oral Language Observation Matrix (SOLOM) (Parker et al., 1985) was created for parents to evaluate the multilingual deaf and hearing children's abilities in their home language(s). A copy can be found in Appendix 4. The SOLOM uses a numeric score (one to five) to define the child's competence in five domains of oral language: comprehension, fluency, vocabulary, pronunciation and grammar. A total score out of 25 corresponds to one of four linguistic competence categories:

- Phase 1: Beginner (score 5–11)

- Phase 2: Intermediate (score 12–18)

- Phase 3: Advanced (score 19–24)

- Phase 4: Proficient (score 25)

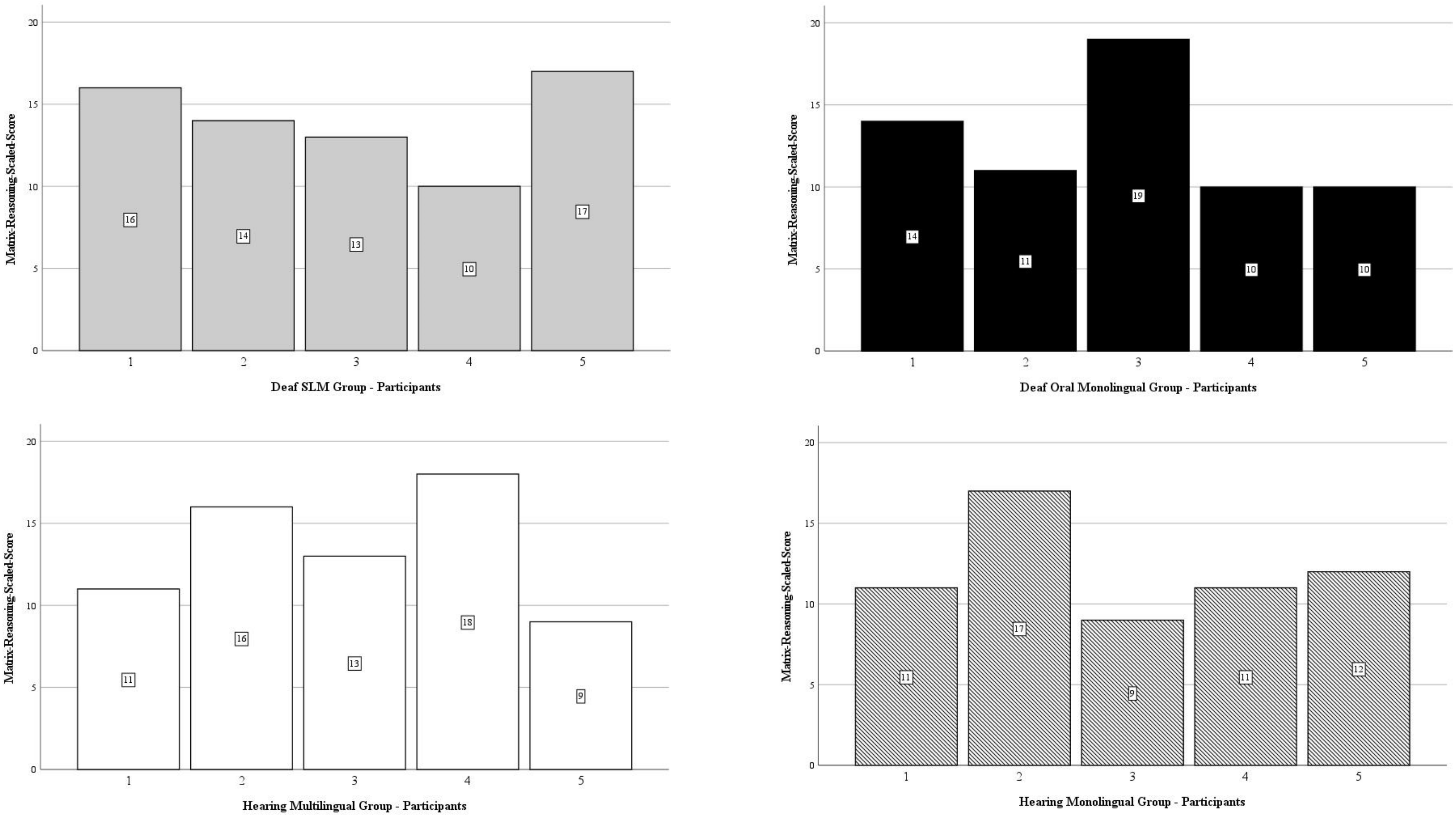
6.4. Results

For each assessment, results are provided for each individual child. Due to the small sample sizes, inferential statistics have not been conducted.

6.4.1. Non-verbal intelligence

The results of the Matrix Reasoning subtest of the WISC-IV UK are reported in Figure 1. All children across all four groups achieved a scaled score of at least nine.

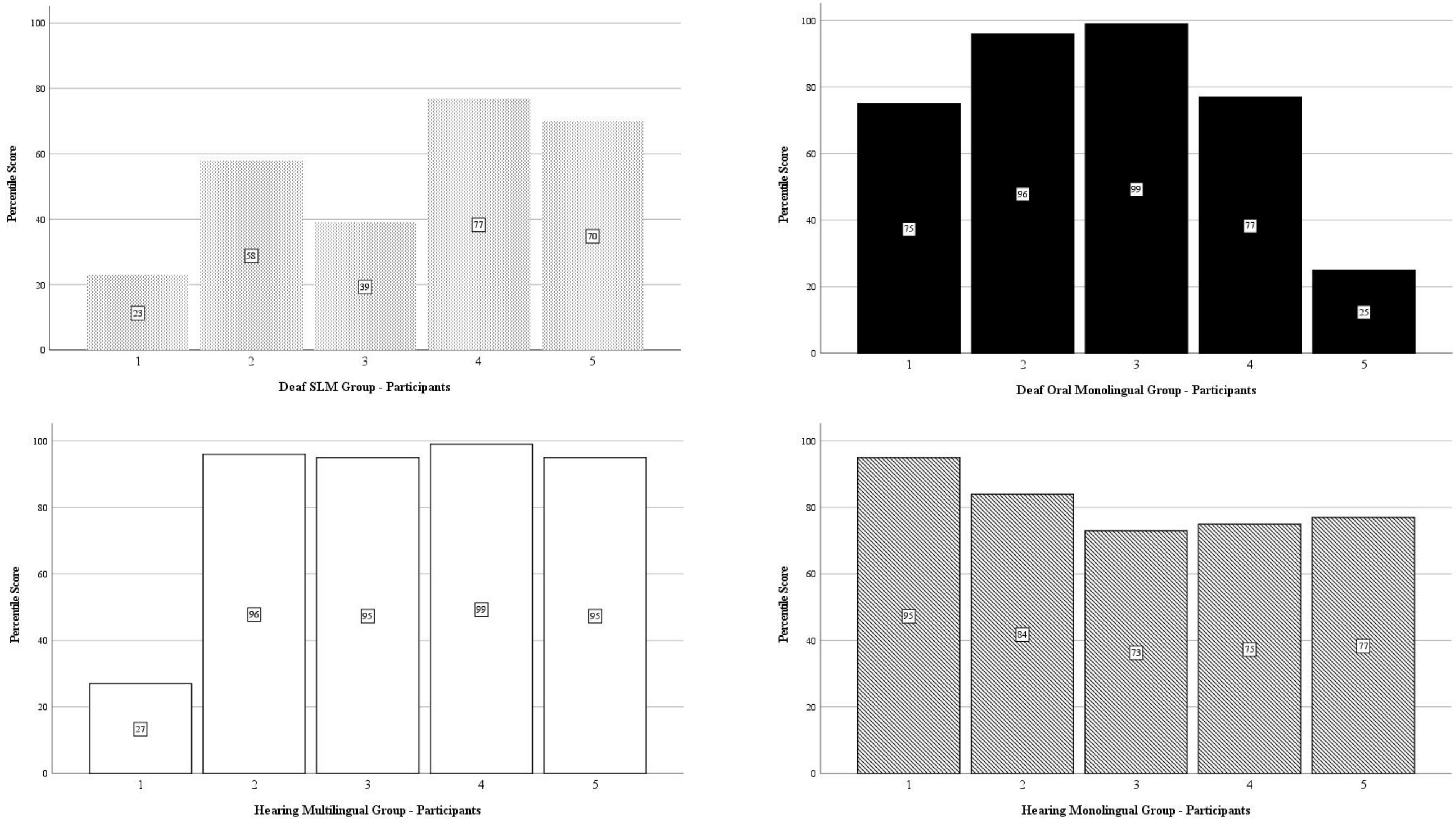
Figure 1: Matrix Reasoning subtest of the Wechsler Intelligence Scale for Children, Fourth UK Edition (WISC-IV UK) results



6.4.2. Expressive vocabulary skills

The results of the EOWPVT-4 are reported in Figure 2. Percentiles are given to provide a sense of where the children would fall relative to hearing monolingual children of the same chronological age. The hearing monolingual group performed the most consistently, with all participants scoring above the 70th percentile. In comparison, participants in the other three groups performed less consistently. In the deaf SLM group, scores varied between the 23rd and 77th percentile, whilst in the hearing multilingual group four of the participants scored in the 95th percentile or above.

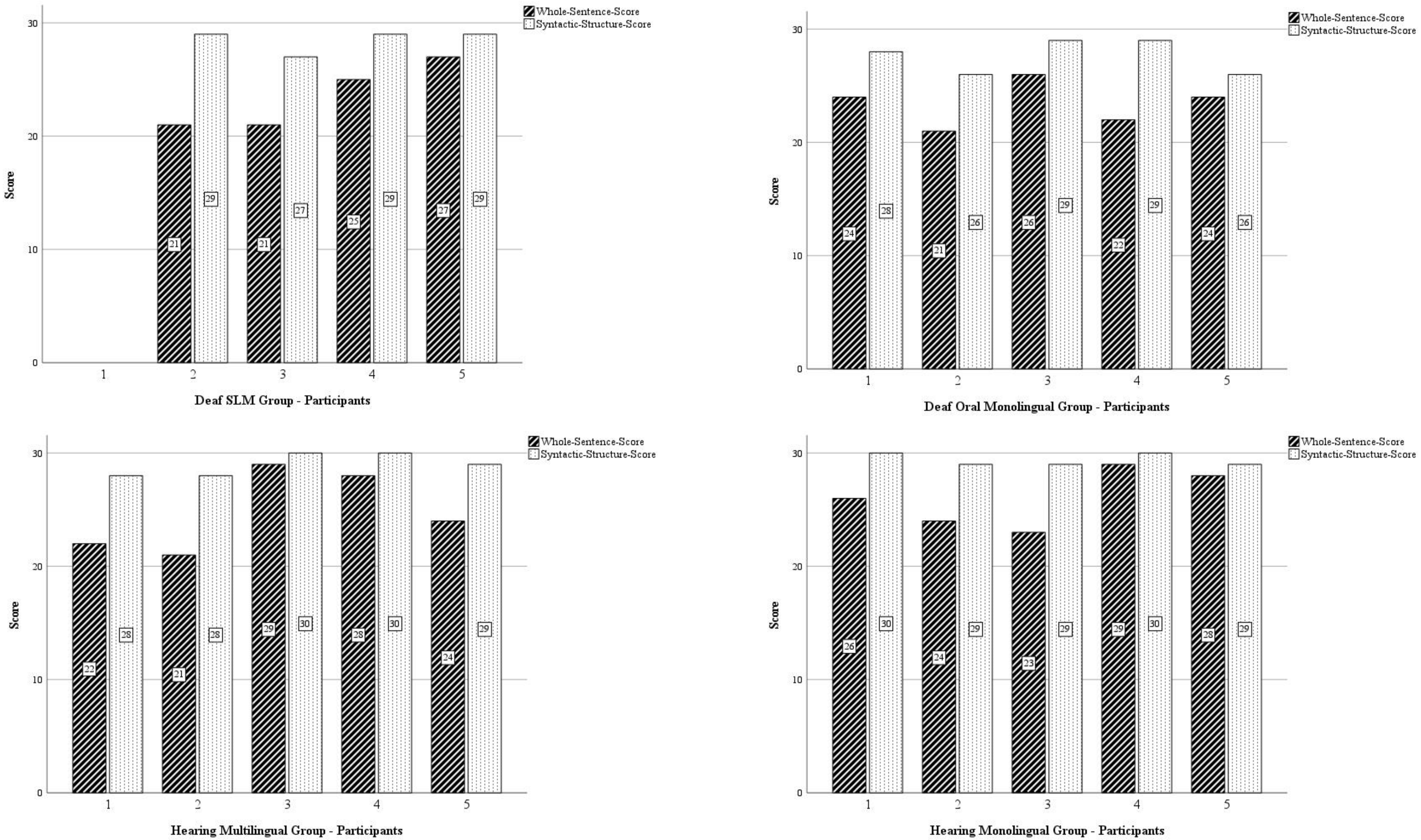
Figure 2: Expressive One-Word Picture Vocabulary Test, 4th Edition (EOWPVT -4) results



6.4.3. Morphosyntactic skills

The results of the LITMUS-SRep task are reported in Figure 3. The results for participant 1 in the deaf SLM group are missing as the quality of the recording was not sufficient for analysis due to a poor internet connection. For both the whole sentence scoring and syntactic structure scoring, all four groups performed very similarly and with particularly high accuracy scores for syntactic structure scoring.

Figure 3: LITMUS sentence repetition task (LITMUS-SRep task) results



6.4.4. Home language proficiency

The results of the SOLOM are reported in Table 6. In terms of the four phases of linguistic competence evaluated by the SOLOM scale, in the case of the deaf children with SLM all five were in phase 3 (Advanced) for at least one of their home languages. One deaf child with SLM spoke two home languages in addition to English; in one home language the participant was in phase 3 (Advanced) and in the other home language the participant was in phase 2 (Intermediate). For the hearing multilingual children, four children were in phase 3 (Advanced) and one child was in phase 2 (Intermediate).

Table 6: SOLOM sub-scores

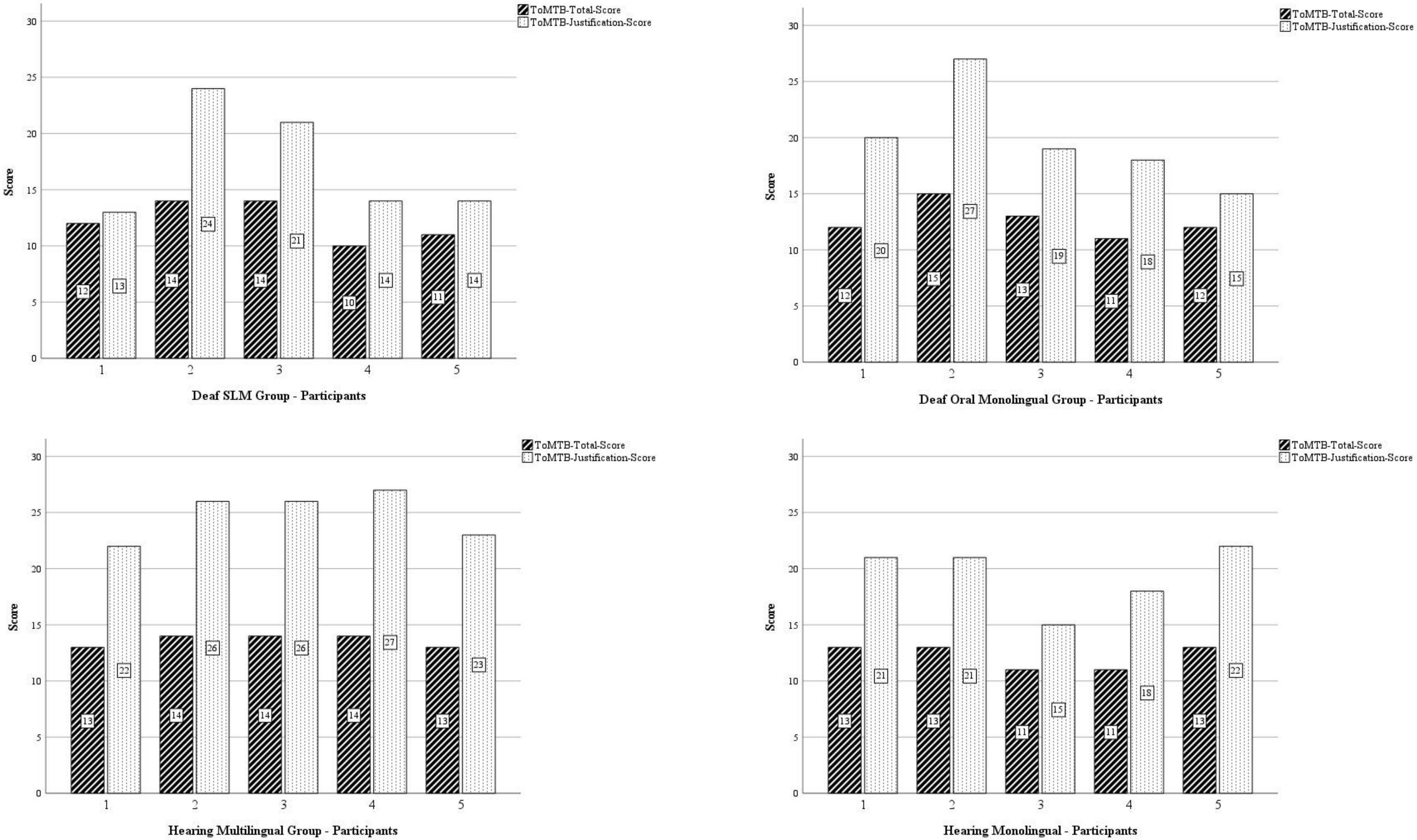
Group	Participant	Comprehension	Fluency	Vocabulary	Pronunciation	Grammar	Total Score	Linguistic competence category
Deaf SLM	1	5	4	4	5	4	22	Advanced
	2	4	4	4	4	4	20	Advanced
	3	4	4	4	4	4	20	Advanced
	4	4	3	4	4	4	19	Advanced
	5	3	2	3	4	3	15	Intermediate
	5	5	5	4	5	5	24	Advanced
Hearing Multilingual	1	4	3	4	4	4	19	Advanced
	2	4	4	4	5	4	21	Advanced
	3	5	4	4	4	5	22	Advanced
	4	4	2	4	3	3	16	Intermediate

	5	4	4	4	4	4	20	Advanced

6.4.5. Theory of Mind skills

The results of the ToMTB are reported in Figure 4. The total score for the ToMTB was similar and fairly high across all of the four groups; however, the hearing multilingual group scored the highest most consistently. There was also more variation between the four groups for the justification score with the hearing multilingual group again performing the highest the most consistently.

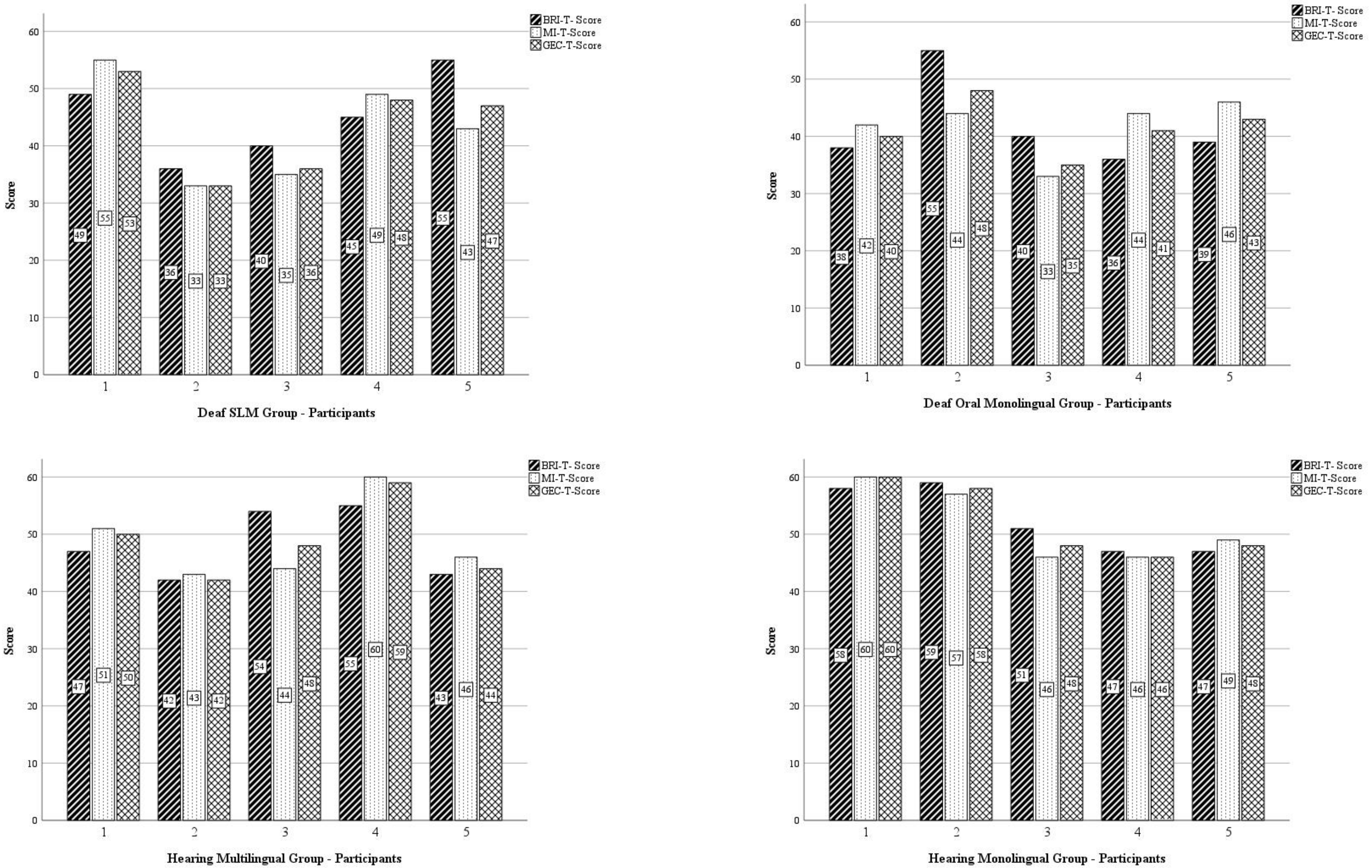
Figure 4: Theory of Mind Task Battery (ToMTB) results



6.4.6. Executive function skills

The BRIEF T-score results for the BRI, MI and GEC are reported in Figure 5. One child, in the hearing monolingual group, fell just in the elevated range for the GEC with a T-score of 60. None of the children had a T-score ≥60 for the BRI and only two children had a MI score ≥60 (one child in the hearing multilingual group and one child in the hearing monolingual group, both with a T-score of 60). No children scored in the clinically significant range (T-score ≥65) for the BRI, MI or GEC.

Figure 5: Behaviour Rating Inventory of Executive Function (BRIEF) results



6.5. Discussion

This study explored the language and cognitive skills of five deaf children with SLM compared with five deaf oral monolingual children, five hearing multilingual children and five hearing monolingual children. Results showed that deaf children with SLM performed comparably to the other three groups on EF and ToM measures and on morphosyntactic abilities in English. While expressive vocabulary skills in English were lowest for the deaf children with SLM, three out of five children scored above average compared to monolingual test norms. Home language performance was also very similar between the deaf and hearing multilingual groups.

These results suggest that deaf children with SLM can achieve comparable English language abilities in morphosyntax, assessed using the LITMUS-SRep task, compared to deaf oral monolingual children, and monolingual and multilingual hearing children. Although expressive vocabulary scores were lowest for the deaf SLM group, it is important to note that the percentiles are normed on TD hearing monolingual children and three of the five children scored above the 50th percentile. Similar findings were reported by Bunta and Douglas (2013) who evaluated the language skills of 20 bilingual Spanish English-speaking deaf children (mean age 51.9 months) and 20 monolingual English-speaking deaf children (mean age 47.3 months). The bilingual deaf children's English language skills were comparable to the monolingual deaf children on all three measures: Auditory Comprehension, Expressive Communication and Total Language scores from the Preschool Language Scale 4th Edition (Zimmerman et al., 2002). McConkey Robbins et al. (2004), Thomas et al. (2008) and Waltzman et al. (2003) also reported that learning a second spoken language does not prevent deaf children from developing high levels of proficiency in the country's majority language.

However, our results contrast with the findings of other previous studies (Deriaz et al., 2014; Forli et al., 2018; Keilmann et al., 2019; Teschendorf et al., 2011). Keilmann et al. (2019) reported that deaf children with SLM (n = 43) performed significantly lower than monolingual deaf children (n = 52) aged 3;0 – 10;11 on tests of receptive grammar and expressive vocabulary in German and both groups scored lower compared with the normative sample. Similarly, Forli et al. (2018) found that deaf children with SLM (n = 14) scored lower (although not statistically significant) on lexical production and morphosyntactic comprehension compared to Italian-speaking monolingual deaf children (n = 14) but scored higher (although not statistically significant) for lexical comprehension. It should be noted though that it is not unusual for hearing multilingual children to score lower on standardised vocabulary assessments compared to hearing monolingual children when assessed in one language (Bialystok et al., 2010).

We evaluated communicative-linguistic competence in the home language(s) for the deaf SLM and hearing multilingual groups using the SOLOM scale. Both groups performed very similarly, with almost all children scoring in the second highest stage of language development (Advanced). The results suggest that, not only are deaf children able to achieve high levels of communicative-linguistic competence in a second spoken language, but that their performance is comparable to multilingual hearing children. In contrast, previous studies that have used the SOLOM to assess the home language in deaf children with SLM have reported greater variability, with a larger proportion of children in the earlier stages of development. Guiberson (2014), Teschendorf et al. (2011) and Forli et al. (2018) who used the SOLOM to measure home language abilities in deaf children with SLM in Spain, Germany and Italy respectively, all reported that the majority of children fell in phase 1 (Beginner) with far fewer reaching the Intermediate to Advanced stages.

Several factors are likely to have played a key role in the strong dual language abilities of the deaf children with SLM in the present study. Firstly, all were diagnosed by three months old, and of those using cochlear implants, the majority were implanted before 12 months old; both factors may positively influence spoken language outcomes (Duchesne & Marschark, 2019; Yoshinaga-Itano, 2003). Additionally, all but one of the children's parents were reported to speak English either "quite well" or "very well" and all had a high level of education (at least undergraduate university degree). Previous research on SLM in deaf children has reported that parents' proficiency in the country's main language and socio-economic status, of which parental education can be a proxy for, relate to language outcomes in this population (Forli et al., 2018; Teschendorf et al., 2011). Furthermore, the children in the present study were "active bilinguals", hearing and speaking the home language and using it regularly in activities including reading, TV, sports and playing with friends. Therefore, the quantity and diversity of input in the home language was high, which has been related to language outcomes in deaf children acquiring two spoken languages (Teschendorf et al., 2011; Waltzman et al., 2003; Yim, 2012). Finally, the present study's small sample size naturally means that variation within the group is likely to be smaller than would be observed in the population.

Two areas of cognition were explored: EF and ToM. The deaf children with SLM performed similarly to the other three groups on EF as measured by the BRIEF, and none of the deaf SLM group, or deaf oral monolingual group, had either elevated or clinically significant BRI, MI or GEC scores. This contrasts with previous studies that have used the BRIEF parent form to assess EF in deaf oral monolingual children, which have reported significantly worse scores and/or increased rates of elevated scores, compared to TD hearing children and/or test norms (Beer et al., 2011; Kronenberger et al., 2014). However, in line with the present study, Goodwin et al. (2022) found that none of the three groups of deaf preschool-aged children (early American Sign Language (ASL), later ASL and later English) were significantly more likely to have clinically significant scores compared to the hearing group. Multilingualism may have acted as a protective factor for EF in our study; however, as the deaf oral monolingual children also performed well, good language access through early implantation and intervention may be responsible, in line with the language access account.

For ToM, the deaf children with SLM performed comparably on the ToMTB to the other three groups on the total score. Previous research has reported that deaf children from hearing families can be at risk of delays in ToM compared to TD hearing children and native Deaf signing children (Schick et al., 2007) due to delays in spoken language development and limited exposure to "mentalistic" conversation (Morgan et al., 2014). However, our study's results suggest that the deaf children (monolingual and SLM) are developing ToM abilities in line with their hearing peers.

The multilingual hearing children performed slightly higher than the other three groups on the justification score which may suggest enhanced ToM abilities that have been proposed in this population (Schroeder, 2018). Multilingualism may have, therefore, acted as a protective factor in the development of ToM through better EF abilities, particularly inhibitory control (Carlson et al., 2002) for the deaf children with SLM; however, as the deaf oral monolingual group also performed comparably with the hearing children, their ToM (and EF) performance may be better explained by their oral language abilities and linguistic environments, both of which have been found to influence ToM (Moeller & Schick, 2006; Walker et al., 2017). The deaf children who used cochlear implants were all implanted by 24 months old, and all but one of the deaf children attended AVT, a specialist early intervention therapy focusing on spoken language development and parent coaching. These factors may have played a role in supporting strong oral language abilities and rich linguistic environments that promote ToM and also EF development.

6.5.1. Future directions and limitations

This is the first UK study to explore the language and cognitive abilities of deaf children with SLM and to compare their performance to deaf oral monolingual children, hearing multilingual children, and hearing monolingual children. This study does have several limitations though which provide opportunities for future research on deaf children with SLM. Firstly, a larger sample would allow the relative contributions of deafness and multilingualism to the children's language and cognitive skills to be assessed, as well as examining individual differences as a function of parental education and audiological characteristics. Secondly, the children's home language was assessed indirectly due to the wide range of languages spoken; direct assessment would have provided a more in-depth profile of the children's full linguistic abilities. Thirdly, in the present study, none of the children used BSL or had any additional disabilities which may impact language and cognitive outcomes in deaf children with SLM.

6.6. Conclusions

Deaf children with SLM are an extremely heterogenous group and this study has focused on a sub-set of this population. Whilst the results may not generalise to all deaf children with SLM, they have shown that speaking multiple languages and developing EF and ToM abilities in line with their TD hearing peers, is achievable for deaf children under certain circumstances. In the present study, deaf children with SLM were found to have comparable abilities in ToM and EF, as well as English morphosyntax compared to deaf oral monolingual children, as well as monolingual and multilingual hearing children. Communicative competence achieved in their home language was also commensurate with the hearing multilingual group. The results of this study will help professionals support multilingual parents to make informed communication decisions on whether to raise their deaf child with their home language in addition to the country's majority language and/or a signed language.

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Chapter 7: General Discussion

7.1. Chapter aims

Increasing numbers of deaf children are born into multilingual families whose home language is a spoken language other than the country's majority language. As most deaf children are born to hearing parents, the decision-making process around communication choice can be challenging and as a result professional advice can be very influential (Crowe, Fordham, et al., 2014; Crowe, McLeod, et al., 2014; Eleweke & Rodda, 2000; Kluwin & Stewart, 2000; Steinberg et al., 2003). However, no studies in the UK, and very few internationally, have been conducted on the factors that influence multilingual parents' decisions to raise their deaf child with SLM and on the advice given by professionals. Furthermore, research on language outcomes for deaf children with SLM is very limited and findings are inconclusive, making it challenging for professionals to provide evidence-based advice.

This thesis aimed to explore SLM in deaf children, both in terms of the decision-making process around raising deaf children with multiple spoken languages and with regards to the language and cognitive outcomes that deaf children with SLM can achieve. Three studies, designed around the evidence-based practice framework, were conducted to address these gaps in the literature and to support professionals in their role in helping multilingual parents make informed communication decisions. The aim of this final chapter is to: 1) summarise the key research findings of each of the three studies presented in the thesis, 2) consider the limitations of the thesis and opportunities for future research, and 3) discuss the implications of the studies for clinical practice.

7.2. Overview of research findings

The key findings from each of the three studies within this thesis will be discussed in relation to the three research questions put forward in chapter 2.

7.2.1. Research Question 1: What beliefs do professionals have on SLM in deaf children and what advice do they give to parents?

A quantitative study (chapter 4) was conducted using an online questionnaire to investigate the professional beliefs of 108 UK-based Teachers of the Deaf, speech and language therapists and audiologists on whether deaf children can acquire multiple spoken languages and to explore their role in parental decision-making around SLM. Nearly all the professionals who participated believed it was "completely true" or "mostly true" that deaf children can develop two spoken languages; however, if the child has additional speech and/or language impairments far fewer agreed. In terms of the factors that affect SLM in deaf children, all or nearly all participants agreed with the following: quantity of exposure; opportunities to speak the languages; age of diagnosis; age of receiving hearing technology, and additional speech, language and/or communication impairments or comorbid diagnoses. Audiologists were also twice as likely to agree oral-aural programmes were a contributing factor compared to speech and language therapists. Nearly all the professionals believed that SLM results in maintenance of the home language, improved family relationships and dynamics, access to the home language culture and better identity/sense of self. However, audiologists were 11 times more likely than SLTs to report linguistic confusion, and Teachers of the Deaf at least 11 times more likely to report reduced proficiency in English and the home language as a result of bilingualism.

With regards to the professionals' role in parental decision-making around SLM, almost all speech and language therapists and Teachers of the Deaf, and just under three quarters of audiologists said they would give advice if asked. However, in practice, 77.0% of speech and language therapists and 64.0% of Teachers of the Deaf reported being asked, compared to only 36.4% of audiologists. In terms of the advice given, the study found that most professionals would advise parents to speak in their home language, regardless of the parents' English language proficiency. Finally, a far greater percentage of speech and language therapists compared to Teachers of the Deaf, and audiologists believed that parents' decisions were influenced by professional advice and that professionals have a role in the decision-making process around SLM (70.2% vs 40% vs 36.4% and 80.9% vs 56.0% vs 36.4% respectively).

7.2.2. Research Question 2: What factors influence the decisions multilingual parents of deaf children make on whether to raise their child with multiple spoken languages?

A qualitative study (chapter 5) involving one-to-one interviews was conducted to explore the decision-making process around SLM for deaf children from the parents' perspective and to provide a unique comparison with multilingual parents of hearing children. The study highlighted the complexity of the decisions parents of deaf children face when deciding whether to raise their child with SLM and the wide range of factors that can influence the family language policies they construct. Four key themes were identified which influenced the decisions parents made on SLM: (1) additional benefits for the child; (2) knowledge and professional advice; (3) family and social influences; and (4) family dynamics and negotiation.

Both parents of deaf children and parents of hearing children stressed the importance of providing good language models in their home language and the role that the home language plays in supporting their child's cultural identity and relationships. However, for parents of deaf children professional advice also played a key role in their decision-making. Parents reported feeling uncertain and anxious as a result of their child's diagnosis and their lack of knowledge on language outcomes in deaf children with SLM. An absence of accessible information and limited opportunities to speak to other multilingual parents of deaf children resulted in them placing a high level of value and trust in professionals. As a result, professional advice greatly influenced the language choices they made, although the advice given varied greatly with some professionals supporting SLM whilst others recommended using just one language. Parents almost always followed the professional advice they received but inconsistent advice was reported to make the decision-making process even more challenging. By exploring both the internal and external factors that influenced the parents' language choices, it was clear that their own ideologies were in constant interaction with those held by professionals. Consequently, the level of agency, power and ultimately choice that parents had in constructing their FLPs was, to varying degrees, impacted by the professional advice they received.

7.2.3. Research Question 3: What are the language (vocabulary and morphosyntax) and cognitive (executive function and Theory of Mind) abilities of deaf children with SLM?

The final study (chapter 6) directly examined the language and cognitive abilities of five deaf children with SLM and compared their performance to five deaf oral monolingual children, five hearing multilingual children and five hearing monolingual children. The children, aged seven to ten years old, were matched as closely as possible on demographic and audiological factors. Two domains of language in English were evaluated, expressive vocabulary and morphosyntax. Morphosyntactic skills in English were measured using the LITMUS sentence repetition task (LITMUS-SRep task) (Marinis & Armon-Lotem, 2015). On both measures, whole sentence scoring and syntactic structure scoring, the deaf children with SLM performed comparably to the other three groups of children. Expressive vocabulary skills in English were assessed using the Expressive One-Word Picture Vocabulary Test, 4th Edition (EOWPVT-4)

(Martin & Brownell, 2011). Although the deaf children with SLM performed the lowest out of the four groups, three of the five children scored above average compared to monolingual test norms on children with typical hearing. The multilingual deaf and hearing children's home language(s) was assessed informally using an adapted version of the Student Oral Language Observation Matrix (SOLOM) (Parker et al., 1985). The parental-report found that the deaf children with SLM performed in line with the hearing multilingual children, with all five children achieving the Advanced phase of language development for at least one of their home languages.

Two domains of cognition were analysed, Theory of Mind (ToM) and executive function (EF). Executive function skills were assessed using the Behaviour Rating Inventory of Executive Function (BRIEF) (Gioia et al., 2000). None of the deaf children with SLM scored in the clinically significant range for either the overall composite score or the two broader indexes. Theory of Mind abilities were assessed directly using the Theory of Mind Task Battery (ToMTB) (Hutchins & Prelock, 2010). The deaf children with SLM performed similarly to the other three groups for the total score which was fairly high across the groups. However, there was greater variation between the groups for the justification score, especially within the group of deaf children with SLM.

7.3. Theoretical contributions

The first theoretical contribution of this research is that it provides novel insights and a holistic understanding of how multilingual parents of deaf children construct their FLPs by taking a sociological approach to the field of FLP. Whist research on FLPs has traditionally focused on multilingual families with hearing children and only limited attention has been given to monolingual families with deaf children, the present research has expanded the field to consider how these two factors interact. Through exploring the micro (family) and macro (societal) factors that influence, and constrain, the FLPs of multilingual parents of deaf children, the first and second studies in this dissertation (chapter 4 and 5) provide a holistic understanding of the interconnections between them. Whilst multilingual parents unanimously held positive beliefs about using the home language alongside English, they were in constant interaction with professional ideologies at the macro level.

The second theoretical contribution that this dissertation makes is with regards to the highly debated bilingual advantage in cognition and the causal nature of EF difficulties in deaf children. Many studies argue that a bilingual advantage in EF and ToM exists (Kroll & Chiarello, 2016; Schroeder, 2018); however, its existence is also highly contested (Dahlgren et al., 2017; Dick et al., 2019). The third study in this dissertation (chapter 6) found that the multilingual deaf and hearing children performed comparably with the monolingual deaf and hearing children on EF and ToM. Therefore, the present study did not find evidence in favour of a bilingual cognitive advantage in either domain. Furthermore, the fact that the deaf children, both monolingual and those with SLM, performed similarly to the hearing children contributes towards the debate on why deaf children can be at risk of EF difficulties. The findings in this dissertation do not support the argument that hearing deprivation directly leads to EF difficulties (i.e. the auditory access account (Kral et al., 2016)) and therefore, appear to be in favour of the language access account, which argues that EF is impaired as a result of language deprivation. This account seems more plausible as in the present study all the deaf children had strong language abilities. Regarding ToM, deaf children from hearing families are argued to be at risk of delays due to poorer language abilities and receiving less caregiver mental-state talk (Moeller & Schick, 2006; Walker et al., 2017).

Whilst it is not possible to conclude from the final study (chapter 6) why the deaf monolingual and multilingual children performed comparably to both groups of the hearing children, they did exhibit good language abilities and all but one attended AVUK where parents are coached to provide linguistically rich environments. In addition, within this self-selected sample of parents, almost all were educated to university degree level, and all were very supportive of their child's language development in either the one or multiple spoken languages.

The three studies in this dissertation cohere around the evidence-based practice framework which, although is not a theoretical framework in its own right, informs clinical practice. The collective objective of the three studies was therefore to support professionals in using the evidence-based practice framework when supporting multilingual parents in their decision-making around SLM for their deaf child. On reflection, professional beliefs appear to play a significant role in parental decision making on SLM through the advice that they give. However, the evidence-based practice framework used in the present research did not include the fourth component which has recently been added – contextual evidence (McCurtin & Clifford, 2015). This additional dimension refers to resources and service/organisational policies and the impact that these pragmatic and contextual factors can have (McCurtin & Clifford, 2015). Therefore, the current research did not explore the multifaceted clinical environment within which professionals make decisions and consequently how contextual evidence may have shaped their professional beliefs and the advice they give.

7.4. Consideration of limitations and opportunities for future research

7.4.1. Limitations

Limitations specific to each individual study have already been discussed within each of the three relevant chapters (4, 5 and 6); however, there are two general limitations of this thesis which will be covered below in more detail.

The first main limitation of this thesis is how representative each study is of its respective population. In the first study (chapter 4), professionals who participated chose to take part and, as a result, self-selection bias may be present. Of the 108 professionals who participated, 65.7% reported they had knowledge of another language(s) (spoken and/or signed). Therefore, there is a high chance that they had a greater interest in and knowledge of multilingualism compared to professionals who chose not to participate. This may have impacted their professional beliefs on the ability of a deaf child to acquire two spoken languages and consequently their advice to multilingual parents considering this language choice. In addition, whilst the recruitment strategy targeted all four nations in the UK, 38% of the participants reported that they were working in London, which has a greater percentage of multilingual children compared to the national average (Department for Education, 2020). This bias in geographical spread meant that a large proportion of the participants were highly likely to have a high number of children on their caseload from multilingual families. As a result, they may have different practices to professionals who work in other parts of the UK where multilingualism is far less common. Overall, the professionals in this study may not be representative of all professionals within these three fields (speech and language therapy; audiology and D/deaf education) in the UK.

The second study (chapter 5) likewise had limitations regarding sampling. The first main limitation was that only multilingual parents of deaf and hearing children who spoke English proficiently were able to complete the interviews. As a result, the decision-making process around SLM experienced by multilingual parents who do not speak English proficiently could not be explored. This was a significant limitation as this sub-set of multilingual parents of deaf children may have different experiences, particularly with regards to the role that professional advice plays in their language choices. These families may also face additional barriers to accessing information on SLM in deaf children, most obviously relating to the need for interpreters. Sampling limitations also included the fact that the multilingual parent was always interviewed, as opposed to the monolingual parent present in some families, and also only a few fathers participated. The parent's level of education was also not recorded which could have acted as a proxy for socioeconomic status (SES), and none of the deaf children's parents were deaf themselves and/or native users of British Sign Language (BSL). In addition, the profiles of the parents' deaf children were fairly homogenous. The majority of the deaf children were diagnosed with a sensorineural severe-to-profound deafness by three months old and almost all received bilateral cochlear implants by 24 months old. Therefore, the parents' decisions, factors that influenced their decisions and professional advice they received may not be representative of families with deaf children who have different audiological profiles.

Similar sampling limitations were present in the third study (chapter 6). Like in the second study (chapter 5), the audiological characteristics of the deaf children (SLM and oral monolingual) were very similar. All were diagnosed by three months old, and the majority had a sensorineural severe-to-profound deafness, implanted by 24 months old. In addition, all but one of the deaf children had attended Auditory Verbal Therapy (AVT) and none used BSL. As was the case for the second study (chapter 5), females were also again underrepresented. Additionally, as the data collection sessions were arranged through the child's parents, only children with at least one parent who spoke English proficiently, and who had access to the internet at home could participate. The children's parents also all had a high level of education. As such, the study reported on the language and cognitive abilities of one sub-set of deaf children with SLM, rather than a more fully representative range.

In contrast though, the deaf children with SLM came from a wide range of different language backgrounds, reflecting the diversity seen in the UK. It was decided that deaf children with SLM with a specific language combination would not be recruited due to the additional recruitment challenges this would create, but it also meant that only their skills in English could be directly assessed, and parental reports had to be used to indirectly assess their skills in their home language. This is not an uncommon situation in studies of bilingual and multilingual children in the UK (e.g. Dixon et al., 2020; Valentini & Serratrice; 2022), but limiting assessment to the language of schooling only gives a partial picture of the child's linguistic repertoire and falls somewhat short of a holistic approach. Recruitment for the third study, as discussed in chapter 3, was extremely difficult and further limiting the potential pool of applicants was not a viable option. In summary, as with the first and second studies (chapters 4 and 5), the generalisability of the results may therefore be limited to deaf children with these particular audiological and demographic characteristics.

The second general limitation relates to treating the multilingual children, both deaf and hearing, as homogenous groups in terms of their multilingualism. As previously mentioned, the deaf children with SLM did not have the same linguistic profile. A range of home languages were spoken, and their exposure and use of the home language(s) also varied, although all were active multilinguals. The problem with using categorical models of bilingualism is that they do not take into account the heterogeneity that exists within each of the discrete groups (Kremin & Byers-Heinlein, 2021). As a result, some researchers have constructed more specific bilingual groups with stricter inclusion and exclusion criteria, for example "early bilinguals" or "late bilinguals" (Surrain & Luk, 2017). However, as the parameters for the bilingual groups are frequently not well specified, this approach can make it hard to generalise the results and/or compare the findings to other studies claiming to use the same sub-category (de Bruin, 2019; Surrain & Luk, 2017).

Consequently, bilingualism is increasingly being considered as a continuum, as opposed to a dichotomous category of bilingual vs monolingual, influenced by several aspects including age of acquisition, exposure, use and proficiency (de Bruin, 2019; Luk & Bialystok, 2013; Marian & Hayakawa, 2020) As a result, the effect of these different variables can be explored. This continuum spans from a monolingual individual who has never had any exposure to another language, right to a bilingual individual who is fully and equally proficient in both languages (Kremin & Byers-Heinlein, 2021). This model can also be applied to children who are acquiring more than two languages and these different factors interact with each other resulting in an infinite number of different multilingual experiences. However, Kremin and Byers-Heinlein (2021) acknowledge that a continuous model will not be appropriate for all research studies, particularly when the population of interest is small. They also suggest two alternative approaches to defining bilingualism: the factor mixture model and the grade-of-membership model (Kremin & Byers-Heinlein, 2021). These more complex models aim to incorporate properties of both categorical and continuous approaches by collecting data on several variables, chosen by the researcher, to then form categories based on statistical patterns in the data, as opposed to using arbitrary cut-offs (Kremin & Byers-Heinlein, 2021). The models also enable the data to be analysed continuously (Kremin & Byers-Heinlein, 2021).

With regards to the studies in this thesis, a categorical model to defining multilingualism was taken; however, each study was transparent in reporting the participants' characteristics. In the first study (chapter 4) the statements given to the professionals did not specify whether one or both of the child's parents spoke the home language and/or English, and how much exposure to each language the child received. The second and third studies (chapters 5 and 6) did collect data on the children's language background; however, due to the small sample sizes, it was not possible to factor these variables into the analyses. The effect that these dimensions of the multilingual continuum had on the children's language and cognitive outcomes could therefore not be determined. The deaf children with SLM in the third study were also all simultaneous multilinguals and were either born in the UK or arrived when they were one years old. Therefore, due to differences in age of acquisition, use and exposure, the results are highly unlikely to be applicable to deaf children with SLM who have recently arrived in the country. Deaf children who are new arrivals may also have a very different and potentially complex audiological medical history, especially with regards to cochlear implantation and monitoring. In addition, treating the multilingual deaf and hearing children as homogeneous groups meant any potential effects of linguistic distance between the multilingual children's languages and English were not taken into consideration. However, the decision to treat the multilingual deaf and hearing children as homogenous groups was appropriate for the aims of the third study. The aim of this study was to conduct an initial exploration of language and cognitive abilities in deaf children with SLM who live in the UK. As such, the decision to include children with varied linguistic backgrounds, especially in terms of the individual languages spoken, reflected the linguistic diversity that exists in the UK. In addition, as only 13% of deaf children in the UK use multiple spoken languages (CRIDE, 2021), recruiting only one language combination would further add to recruitment challenges.

7.4.2. Opportunities for future research

The research conducted in this thesis is one of the first to explore the topic of SLM in deaf children in the UK, and contributes to the growing, but still limited, international body of research. This thesis has demonstrated the need for further research on this population to deepen our understanding of both the decision-making process around SLM and the language and cognitive outcomes of deaf children being raised multilingually. This research is needed not only for professionals to support them in delivering evidence-based practice, but also for parents who, as the second study (chapter 5) found, have great difficulty accessing information independently to guide their decision-making on SLM.

Firstly, future research on deaf children with SLM should include children from different subgroups within this population. Deaf children with SLM are an extremely heterogenous group and this thesis has focused on a sub-set of this population. The majority of deaf children in the presented studies had a severe-to-profound sensorineural deafness diagnosed by three months old and received cochlear implants by 24 months old. Almost all of the deaf children also attended AVT, an intervention therapy which specifically promotes spoken language development by developing the child’s listening skills. In addition, in the third study (chapter 6), the children’s parents had obtained a high level of education and spoke English proficiently. Previous research on deaf children with SLM has frequently included participant samples which are very heterogenous with regards to demographic and audiological factors, especially those that are known to impact language development. This makes it difficult to assess whether these uncontrolled variables have impacted the reported language performance of deaf children with SLM, thus making it challenging to apply the findings in clinical practice. Future research should therefore, like the third study in this thesis (chapter 6), include homogeneous groups of deaf children with SLM but with different demographic and audiological characteristics, to assess whether the results found in this thesis still apply. Examples of variables that should be considered in addition to the child’s audiological profile include but are not limited to: SES, use of a signed language and presence of additional disabilities. With regards to the children’s language profile, depending on the sample size, a continuum approach could be taken to account for variables such as age of acquisition and amount of exposure to each language. Alternatively, a categorical approach could be used but where the bilingual group has different participant characteristics to those that this thesis focused on. Including different homogeneous groups within the population of deaf children with SLM will help establish what factors impact language and cognitive outcomes within this specific population and ensure professionals and multilingual parents have access to relevant research.

Focus on different sub-groups of deaf children with SLM is also needed within research studies that aim to investigate professional beliefs and advice on the feasibility of spoken multilingualism in this population. Professional opinions and advice may differ depending on the child's audiological, developmental and language profile. Likewise, it is important to explore the decision-making process around SLM from the parents' perspective with regards to different subgroups of deaf children. The factors that influence multilingual parents' decisions and the advice they report receiving may also vary depending on their child's audiological profile and their own demographic characteristics (e.g. education level and language proficiency in the country's majority language). Focus should also be given to parental decision-making in multilingual families where the child's parents are native users of BSL as well as having a spoken home language other than English.

On a wider, more global scale future research on deaf children with SLM is also needed in countries where the sociolinguistic context is very different to that in the UK. The relative impact that micro (family) and macro (societal) factors will have on the communication choices that multilingual parents of deaf children make will almost certainly differ across different global contexts. In particular, the economic, social, cultural and political factors within a country will constrain the level of power and agency parents have in constructing their FLP to different degrees. Future research should therefore explore how differences in societal structures around education, disability, inclusion and language impact the extent to which multilingual parents of deaf children are free to choose, construct and enact their language ideologies and FLPs. For example, the way in which a country's society views deafness and multilingualism, such as the presence of societal stigma around deafness and the status that different languages, including sign language, hold in terms of their value or linguistic capital (Swanwick et al., 2022). Furthermore, the social set up of families differs greatly in different global contexts and the impact of this on decisions around SLM should be explored, for example in contexts where communal intergenerational childrearing practices are common, and where the community plays a significant role (Swanwick et al., 2022). The above factors should also be considered with regards to language outcomes for deaf children with SLM as all will be context sensitive.

Secondly, future research on deaf children with SLM should include longitudinal studies which are currently absent in the existing literature on this population. In terms of research on decision-making around SLM, long-term longitudinal studies would enable the entire communication journey to be explored, providing deeper insights into the decision-making process. This would give a greater understanding of changes in multilingual parents' decisions relating to SLM over time and the factors that influence these changes. For deaf children, these changes may arise following the child's initial diagnosis, after cochlear implantation or in response to changes in the child's own communication preferences (Watson et al., 2008; Wheeler et al., 2009). In addition, the child's views of the family language policy could also be elicited as the child gets older. Although research on family language policy has traditionally focussed on the role of the parents, increased attention has been given to the active role children play (Fogle & King, 2013; Revis, 2019; Smith-Christmas, 2022). Their ability to shape the family language policy by either supporting or contesting their parents' language choices, has led to them being widely conceptualized as agents (Revis, 2019). Parents' recollections of their decision-making experience should also be more accurate in longitudinal studies than those collected through retrospective studies. Furthermore, this type of research design would help identify at which points during the child's communication journey professional advice on SLM is most required and influential, in turn allowing professionals to better support parents and consequently the child. Longitudinal studies would also be beneficial for evaluating outcomes in deaf children with SLM. More specifically, this approach would allow the child's performance in each language, as well as their cognitive skills to be assessed over time, relative to the amount of exposure and use of each language, as well as compared to their deaf and hearing peers.

Thirdly, future research on language abilities in deaf children with SLM should, in addition to standardised assessments, use language sample analysis, which is increasingly recommended for language assessment of multilingual children (Ebert, 2020; Gutiérrez-Clellen, & Simon-Cereijido, 2009; Kapantzoglou et al., 2017). Language sample analysis facilitates the analysis of a wide range of measures that span multiple linguistic domains including vocabulary, morphosyntax and discourse pragmatics (Ebert, 2020). Whilst standardised norm-referenced assessments enable a child's performance to be compared to their peers, language sampling measures how well a child has developed a certain skill (i.e. criterion-referenced assessment). Standardised norm-referenced assessments have many advantages, including allowing a wide range of language skills to be measured quickly; however, language samples can provide a richer in-depth analysis of a child's language abilities in a more ecologically valid way (Botting, 2002). Indeed, Duchesne (2015) argued that for deaf children with cochlear implants, language samples may help to provide a comprehensive description of grammatical development compared to standardised assessments. Language samples would also potentially enable the child's home language(s) to be assessed, through collaboration with an interpreter (for guidelines, see Langdon & Saenz, 2015).

Finally, with regards to early intervention and the education of deaf children with SLM, future research should focus on investigating how intervention can be delivered most effectively to promote the development of spoken language in both the child's home language(s) and the country's majority language. Previous research in the US has demonstrated that receiving intervention in both English and Spanish resulted in better English language performance for deaf children with SLM compared to intervention delivered only in English (Bunta et al., 2016). Future research should explore this further and more specifically, investigate the conditions under which this is successful, including both direct intervention for the child and parent-based coaching programmes for parents.

7.5. Implications for clinical practice

This research has several significant implications for professionals who work with deaf children and their role in supporting multilingual parents to make informed decisions on SLM. Whilst some of the following implications are specifically relevant to professionals who work with deaf children from multilingual families in the UK, others may be applicable to professionals internationally. In this section, the following recommendations will be outlined: (1) increasing awareness of the role that professionals who work with deaf children play in decision-making around SLM; (2) promoting the importance of collaborative shared decision-making around SLM; (3) providing interprofessional training on SLM in deaf children for professionals. In addition, a brief discussion will be included on the practical ways in which clinicians can support multilingual parents of deaf children and children and young people with SLM with regards to their language choices.

First, professionals who work with deaf children from multilingual families need to have an increased awareness of the role they play in parental decision-making concerning SLM. The findings of the second study (chapter 5) have clearly highlighted the high level of trust and value that parents place on professional advice regarding SLM, and the extent to which this can impact the decisions they make. However, in the first study (chapter 4) whilst 70.2% of speech and language therapists believed that parental decisions on language choice are influenced by professional advice, only 36.4% of audiologists and 40% of Teachers of the Deaf agreed. It is therefore crucial that professionals have an increased awareness of the influence that they can have on the language decisions parents make.

This is important for several reasons. Most obviously, is the influence that their advice can have on the language(s) that the child will hear at home. Parents who decide to speak in their non-native language, depending on their proficiency, may not be able to provide optimal language models. Consequently, the quantity and quality of the linguistic input that the child receives, widely recognised to play a key role in language development (Newman et al., 2016; Rowe, 2012), may be reduced. More widely, the language decisions that multilingual parents make and consequently the family language policies they construct, can have a significant impact on a child's cultural identity and relationships, and thus their wellbeing (Gonzales-Backen et al., 2017; Müller et al., 2020; Vuorenkoski et al., 2000). These benefits also extend to the child's family, with higher levels of family cohesion reported for families where the child speaks their parents' home language compared to where the child only speaks the country's majority language (Tseng & Fuligni, 2000). It is important therefore that professionals recognise the wider impact that their advice can have beyond just the child's language development. Furthermore, it is essential that professionals reflect on the immediate impact that their advice can have on the parents and their wellbeing. Parents of deaf children are frequently reported to have higher levels of stress compared to parents of hearing children (Quittner et al., 2010) as well as being at greater risk of developing anxiety (Dogan, 2010). Indeed, the results from the second study in this thesis (chapter 5) highlighted the feelings of uncertainty and anxiety that parents feel following their child's diagnosis and how this is compounded by receiving conflicting advice. Professionals must be aware of this both in terms of the advice they give and the manner in which it is given. This leads us onto the second recommendation around clinical approaches to decision-making.

Second, the importance of collaborative shared decision-making around informed communication choice for multilingual parents of deaf children should be promoted. Several clinical approaches to facilitating decision-making exist and previously there has been a drive towards the informed decision-making model, where professionals provide information and parents complete the decision-making independently (Porter et al., 2018). Whilst this model was viewed as empowering patients (Porter et al., 2018), patients instead reported feeling abandoned (Elwyn et al., 2012) and did not want the decision to be only their responsibility (Charles et al., 1997). As previously acknowledged, the anxiety that parents of deaf children arrive with at the start of the decision-making process means that encouraging them to be autonomous decision-makers is not ideal. In addition, simply providing advice to multilingual parents of deaf children is unlikely to result in an informed decision. An informed decision is made when parents have sufficient knowledge and understanding about their options, and they are able to make a decision that is in line with their own values (Porter et al., 2018). As a result of limited information on SLM in deafness and few opportunities for parent-to-parent support, collaborative discussions on the relative merits of using or not using the home language will be needed.

Consequently, shared decision-making, where “clinicians and patients share the best available evidence when faced with the task of making decisions, and where patients are supported to consider options, to achieve informed preferences” (Elwyn et al., 2012, p. 1361), is likely to be more appropriate for multilingual families. Shared decision-making involves parents and professionals taking on equal roles in the deliberation process; engagement in all aspects of evidence-based practice is therefore crucial. It is important that professionals consider the parents’ values, preferences, and culture, in addition to sharing the available research, when supporting them to consider the benefits and compromises of using or not using the home language(s). Professionals should be open about the limited and inconclusive research findings on language and cognitive outcomes in deaf children with SLM and use their professional expertise to help parents apply the available evidence to their own situation. Decisions on whether or not to use the home language may need to be revisited during the child’s communication journey, so it is important that professionals regularly check-in with parents and offer their support when needed. If, and when, changes regarding using the home language are made, they do not necessarily mean that a “wrong” decision was made at the time, as long as professionals supported parents to make the best decision they could. Furthermore, the child's voice should also be included in these discussions where possible, especially when revisions to the language choices are made as they are likely to be a key driver in these changes. Whilst shared decision making is now widely viewed as good standard practice (Porter et al., 2018), multilingual parents of deaf children are highly likely to appreciate a greater level of involvement from professionals due to the factors discussed above. As several different professional roles will usually be involved, it is essential that a collaborative shared decision-making approach is taken to ensure parents receive consistent evidence-based advice. This leads onto the third recommendation around interprofessional training.

The third, and final, recommendation, as a result of this thesis, is that interprofessional training on SLM in deaf children should be provided for all professionals who work with deaf children and their families. This should not be exclusively for professionals who only work with deaf children in the early years, but for professionals who work with deaf children of all ages. These professionals should include but are not limited to: Teachers of the Deaf; audiologists; cochlear implant teams; health visitors and General Practitioners (GPs). Training should also be available for speech and language therapists who work with deaf children, as well as mainstream nursery and school teachers when required. The training should begin within a review of university and professional training courses to make sure that they include a focus on multilingual populations, and then be revisited as part of a professional's continuing professional development. An increased awareness of deaf children who come from families where the home language is a spoken language other than the country's majority language should first be promoted. This should include raising awareness of the complexity of decision-making around language choices for multilingual parents of deaf children and the wide range of internal and external factors that can impact this, including professional advice. Awareness should also focus on the benefits of raising deaf children with their home language, both in terms of providing optimal language models and the wider positive effects on the child's wellbeing. This should be framed in contrast to the negative outcomes of not using the home language, including restricting the child's access to their home culture, their dual identity and relationships within their family and community. Furthermore, the importance of having conversations with parents about language choices early on and revisiting these throughout the child's communication journey should be stressed. These conversations should include the child's voice where possible and may require interpreters to be present depending on the parents' proficiency in English

Interprofessional training should then also focus on professionals' ability to engage in evidence-based practice. Professionals who work with deaf children have a responsibility to share the research evidence on SLM with parents, whilst using their own professional expertise and considering the parents' values and preferences. The international consensus statement on best practices in family-centred intervention for deaf children, highlights the importance of professionals providing relevant and timely information to parents (Moeller et al., 2013). In order to ensure professionals are providing parents with consistent evidence-based advice, interprofessional training should first focus on ensuring professionals have a fundamental understanding of language development in hearing multilingual children. This will help reduce concern that exposing a child to multiple languages can cause confusion, as well as concerns around reduced proficiency. Finally, interprofessional training should focus on staying up to date on research on SLM in deaf children. In particular, it should highlight that, while the current evidence base has a high degree of variability, it has not found any detrimental effect of raising deaf children with multiple spoken languages (Crowe, 2018). As a result, professionals should not discourage parents from considering raising their deaf child with SLM (Crowe, 2018).

There are many practical ways in which clinicians can support multilingual parents of deaf children and children and young people with SLM with regards to their language choices. The second study in this dissertation (chapter 5) showed that multilingual parents of deaf children found it challenging to access information on SLM and deafness. Furthermore, unlike multilingual parents of hearing children they reported very limited or non-existent opportunities to speak to other multilingual parents of deaf children. Parent-to-parent and family support networks are often highly valued and provide an opportunity for parents to give and receive mutual support and to hear first-hand experiences from others in similar situations. Professionals/charity organisations could therefore consider running workshops/conversation groups for multilingual parents of newly diagnosed deaf children to hear from other parents about their experiences of using or not using their home language alongside English and/or BSL. Including deaf children with SLM would also be beneficial to hear the child's experience of speaking more than one language and equally, it would be advantageous to invite deaf individuals who use BSL to hear their experience of being part of the Deaf world. This would provide parents with an opportunity to consider the potential wider outcomes of using/not using their home language and/or BSL (e.g. cultural awareness, relationships with wider family and sense of identity) through lived experiences, helping them to make informed decisions within a supportive environment. Professionals/charity organisations could also consider forming parent and family support groups specifically for multilingual families of deaf children of all ages as a way of offering parent-to-parent support in maintaining the home language through a mutual understanding of the challenges it can bring. These recommendations will hopefully help professionals who work with deaf children to "promote linguistic accessibility and home languages" in line with best practices in family-centred intervention for deaf children (Moeller et al., 2013, p.437).

7.6. Conclusions

In conclusion, this thesis aimed to explore the decision-making process around SLM from both the parents' and professionals' perspective, and to investigate the language and cognitive abilities of deaf children who use multiple spoken languages. The three empirical studies are the first in the UK to address these topics and add to the growing international literature on deaf children with SLM. The studies highlight the complex and multi-factorial nature of the decision-making process multilingual parents experience when deciding whether to raise their deaf children with SLM, and the key role that professionals play. Furthermore, the results demonstrate that deaf children with SLM can learn multiple spoken languages and develop cognitive abilities comparable with their hearing peers. The hope is that together, these findings will have implications for the way in which professionals can engage in evidence-based practice to support multilingual parents of deaf children to make informed communication choices around SLM.

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Appendices

Appendix 1: Survey Questions

The first set of questions are about your professional opinion on a deaf child's ability to learn two spoken languages. One language is the child's home language (this could be spoken by one or both of the child's parents) and the other language is English.

Terminology we would like to clarify:

The term 'proficiency' in the statements below refers to the ability to understand spoken/signed language and use spoken/signed language to communicate with others effectively at an age-appropriate level. It does not refer to written language.

The term 'speech, language and/or communication impairments' in the statements below refers to significant and persistent difficulties in addition to the delay in speech and language development that can be expected in a child who is deaf.

Consider a deaf child (with hearing parents) in your age setting who could have a bilateral severe-to-profound sensorineural deafness (diagnosed before 6 months old) and who received bilateral cochlear implants by the age of two.

The child has the potential to develop:

1. Two spoken languages (including English).

- Completely true
- Mostly true
- Partially true
- Not true

2. English and British Sign Language (BSL).

- Completely true
- Mostly true
- Partially true
- Not true

3. Two spoken languages (including English) and BSL.

- Completely true
- Mostly true
- Partially true
- Not true

4. Two spoken languages (including English) if they have additional speech and/or language impairments.

- Completely true
- Mostly true
- Partially true
- Not true

5. English and BSL if they have additional speech and/or language impairments.

- Completely true
- Mostly true

- Partially true
- Not true

6. Two spoken languages (including English) and BSL if they have additional speech and/or language impairments.

- Completely true
- Mostly true
- Partially true
- Not true

In a deaf child (with hearing parents) with a bilateral severe-to-profound sensorineural deafness (diagnosed before 6 months old) who received bilateral cochlear implants by the age of two:

7. Factors that affect their ability to acquire two spoken languages (including English) include (please select all those that apply):

· Degree of deafness

· Age of diagnosis

· Type of hearing technology used (e.g. hearing aids/cochlear implants/BAHA)

· Age of receiving hearing technology

· Socio-economic status of the family

· Enrolment in oral-aural programme

· Presence of additional speech, language and/or communication impairments

· Presence of comorbid diagnoses (e.g. Autism Spectrum Disorder)

· Parents’ proficiency level in English

· Quantity of exposure to the two languages

· Opportunities to speak the two languages

· What language the main caregiver speaks

· Whether both parents speak the home language to the child

· Number of different speakers in the two languages that interact with the child

· Other please state: ………………………………………………………………...

8. Activities in the home language (e.g. singing nursery rhymes or reading) support English language acquisition (e.g. activities in Polish support language development in English)

- Yes
- No
- Don’t know

9. Exposure to two spoken languages can lead to (please select all those that apply):

- Maintenance of the home language
- Improved family relationships and dynamics
- Linguistic confusion
- Access to the culture of the home language

- Difficulties developing relationships with peers
- Better identity/sense of self
- Speech, language and/or communication difficulties
- Reduced proficiency in English
- Reduced proficiency in the home language
- Advantages in cognitive skills (e.g. Theory of Mind or Executive Function)
- Reduced academic achievement in English at school
- Poorer family relationships and dynamics
- Other please state: ………………………………………………………………...

10. Not using the home language with the child, when their family are bilingual (in spoken languages), can affect their (please select all those that apply):

- Ability to communicate with family members
- Access to culture
- Identity/sense of self
- Family relationships and dynamics
- English language proficiency
- Maintenance of the home language
- Likelihood of having speech, language and/or communication difficulties
- Other please state: ………………………………………………………………...

The second set of questions are about what advice you would give as a professional to hearing parents of deaf children about raising their deaf child to speak two spoken languages (where one language would be the home language and the other language would be English).

11. Do parents of deaf children ask you for advice on whether they should speak English or their home language with their child?

- Yes and I do give advice
- Yes but I do not give advice
- No but I would give advice if I was asked
- No and I would not give advice if I was asked
-

11b. If selected 'Yes and I do give advice': Please give an example of where you gave parents advice on which language(s) to use with their child.

…………………………………………………………………………………………………

Please rate the following statements:

12. The decisions parents make about what language(s) to speak to their deaf child in are influenced by the advice they receive from professionals.

- Completely true
- Mostly true
- Partially true
- Not true

13. Professionals have a role in helping to advise parents of deaf children on what language(s) they should speak to their child in.

- Completely true
- Mostly true
- Partially true
- Not true

With a parent whose first language is **not** English and who does **not** speak English proficiently:

14. Professionals should advise parents to speak their home language to their deaf child.

- Completely true
- Mostly true
- Partially true
- Not true

15. Asking the parent to speak in their home language will have a negative effect on their child's English language skills.

- Completely true
- Mostly true
- Partially true
- Not true

With a parent whose first language is **not** English but who **does** speak English proficiently:

16. Professionals should advise parents to speak their home language to their deaf child.

- Completely true
- Mostly true
- Partially true
- Not true

17. Asking the parent to speak in their home language will have a negative effect on their child's English language skills.

- Completely true
- Mostly true
- Partially true
- Not true

The last set of questions are designed to collect background information on your professional role, the professional setting you work in, the languages you speak and training you have received.

18. Please select the profession you are currently working as:

- Speech and Language Therapist
- Audiologist
- Teacher of the Deaf (completed mandatory training)
- Teacher of the Deaf (without mandatory training)

19. When did you qualify as a Speech and Language Therapist, Audiologist or Teacher of the Deaf?

- Within the last year
- 1-5 years ago
- 6-15 years ago
- 16-30 years ago
- 31+ years ago
- N/A

20. Where did you qualify as a Speech and Language Therapist, Audiologist or Teacher of the Deaf?

- South East
- London
- South West
- West Midlands
- East Midlands
- East England
- Yorkshire & Humber
- North East
- North West
- Scotland
- Wales
- Northern Ireland
- Outside the UK

- N/A

21. Where in the UK do you currently work with deaf children?

- South East
- London
- South West
- West Midlands
- East Midlands
- East England
- Yorkshire & Humber
- North East
- North West
- Scotland
- Wales
- Northern Ireland

22. Where else (if applicable) have you worked with deaf children? (You may select more than one option)

- South East
- London
- South West
- West Midlands
- East Midlands

- East England
- Yorkshire & Humber
- North East
- North West
- Scotland
- Wales
- Northern Ireland
- Outside the UK
- N/A

23. Which of the following options best describes the status of the setting you currently work in with deaf children?

- NHS
- Education (e.g. school or college)
- Private sector
- Charity organisation
- Other (please state)

24. If you are a Speech and Language Therapist, please select which of the following best describes your employment setting. (If you are not a Speech and Language Therapist, please select 'Not Applicable').

- Speech and Language Therapist in a specialist pre-school for the deaf
- Speech and Language Therapist in a specialist school for the deaf

- Speech and Language Therapist in a hearing impairment unit in a mainstream school
- Speech and Language Therapist in a special school or college not specifically for deaf children
- Speech and Language Therapist in a community role
- Speech and Language Therapist in a cochlear implant centre
- Speech and Language Therapist in an independent clinic
- Other please state: ………………………………………………………………...
- N/A

25. If you are an Audiologist, please select which of the following best describes your employment setting. (If you are not an Audiologist, please select 'Not Applicable').

- Audiologist in an audiology clinic
- Audiologist in a cochlear implant centre
- Other please state: ………………………………………………………………...
- N/A

26. If you are a Teacher of the Deaf, please select which of the following best describes your employment setting. (If you are not a Teacher of the Deaf, please select 'Not Applicable').

- Teacher of the Deaf in a specialist pre-school for the deaf
- Teacher of the Deaf in a specialist school for the deaf
- Teacher of the Deaf in a hearing impairment unit in a mainstream school

- Teacher of the Deaf in a special school or college not specifically for deaf children
- Peripatetic Teacher of the Deaf
- Teacher of the Deaf in an independent clinic
- Other please state: ……………………………………………………………...
- N/A

27. Which of the following options best describes the status of settings you have previously worked in with deaf children? (You may select more than one option)

- NHS
- Education
- Private sector
- Charity organisation
- Other please state: ……………………………………………………………...
- Not applicable

28. How long have you worked with deaf children?

- 1 year or less
- 2-3 years
- 4-10 years
- 11-20 years
- 21+ years

29. What age are the deaf children you currently work with? (You may select more than one option)

- Under 5 years
- 5 – 11 years
- 11 – 16 years
- 16 – 18 years

30. Have you previously worked with deaf children in a different age group? (You may select more than one option)

- Yes – under 5 years
- Yes – 5-11 years
- Yes – 11-16 years
- Yes – 16-18 years
- No

31. Do you currently work with or have worked with deaf children who are being brought up to use **English and BSL**?

- Yes
- No

32. Do you currently work with or have worked with deaf children who are being brought up to use **2 spoken languages** (not including BSL)?

- Yes
- No

32b. For participants who selected YES: Please give an example of a deaf child you have worked with who used two spoken languages, briefly describing the child's deafness and hearing technology used, as well as their abilities in both languages relative to their age.

………………………………………………………………………………………………

33. Do you currently work with or have worked with deaf children who are being brought up to use **two spoken languages and BSL**?

- Yes
- No

33b. For participants who selected YES: Please give an example of a deaf child you have worked with who used two spoken languages and BSL, briefly describing the child's deafness and hearing technology used, as well as their abilities in both languages relative to their age.

………………………………………………………………………………………………

34. Do you speak any languages in addition to English?

- Yes
- No

34b. For participants who selected 'Yes': Please write each language you know (in addition to English) next to the corresponding fluency level.

- Completely fluent
- Quite fluent
- Conversational level
- Less than conversational level

35. Have you received any training on working with deaf children who use more than one spoken language?

- No
- Yes - 1 day or less CPD course (online or workshop)
- Yes – More than 1day CPD course (online or workshop)
- Yes – 1 day or less on undergraduate degree course
- Yes - More than 1 day on undergraduate degree course
- Yes - Postgraduate module
- Yes - Higher qualification (MRes/MPhil)

35b. For participants who selected ‘Yes’: Please could you briefly explain what the training focussed on. (If you have not attended any training please write 'N/A').

………………………………………………………………………………………...

36. Would you like to receive training on working with deaf children who use more than one spoken language?

- Yes
- No

End of questions – Thank you for participating in this questionnaire

Appendix 2: Semi-structured topic guide

Domain	**Question**
Parents' views on multilingualism	• Why is it important for your child to be multilingual and speak more than one language?
The factors that influenced the parents' decision-making process	• Before your child was born, had you already thought about the languages your family would use with your child? • Did you look for information on raising multilingual children, deaf or hearing, and if so, what information did you find? • Did you receive any advice from family and friends about raising your child to speak more than one language and if yes, did it influence your decision? • Did you receive any advice from professionals about raising your child to speak more than one language and if yes, did it influence your decision? • Do you feel your decision was supported by professionals and your family/friends, both when your child was a baby and since then?

The factors that influenced the parents' decision-making process *For parents of deaf children only*	• Did these plans/decisions change at all when you found out your child was deaf? • Have you ever considered using a signed language either British Sign Language (BSL) or another signed language?

Appendix 3: Language history questionnaire

This questionnaire is designed to collect background information on the languages your child uses.

Home language(s) refers to the language(s) spoken at home that is/are not English.

Thank you for taking part and for completing this questionnaire.

Part 1: About the child

1 Child's name:

2 Where was your child born?

3 What is your child's date of birth?

4 When did your child arrive in the UK (if they were born here please write N/A)?

5 What languages are used at home with your child?

6 At what age did your child start being spoken to in English on a regular basis?

- 0-1 years old
- 1-2 years old
- 2-3 years old
- 3-4 years old
- 4-5 years old
- 5-6 years old
- Other

a If you selected Other, please specify:

7 Where did your child start receiving regular exposure to English for the first time?

- at home
- at nursery
- at playgroup
- at primary school
- Other

a If you selected Other, please specify:

Part 2: About the parent(s)

8 Where were you born?

9 When did you arrive in the UK (if you were born here please write N/A)?

10 How well do you speak English?

- very well
- quite well
- not well
- not at all

11 What language(s) do you use with your child?

	Always	Usually	Half the time	Rarely	Never	Not applicable
Home language						
English						
British Sign Language (BSL)						
3rd language (only if there is)						

12 What language(s) does your child use with you?

	Always	Usually	Half the time	Rarely	Never	Not applicable
Home language						
English						
British Sign Language (BSL)						
3rd language (only if there is)						

13 Is your child being raised by their other parent as well as you?

- Yes
- No

a Where was your child's other parent born?

b When did your child's other parent arrive in the UK (if they were born here please write N/A)?

c How well does your child's other parent speak English?

- very well
- quite well
- not well
- not at all

d What language(s) does your child's other parent use with your child?

	Always	Usually	Half the time	Rarely	Never	Not applicable
Home language						
English						
British Sign Language (BSL)						
3rd language (only if there is)						

e What language(s) does your child use with their other parent?

	Always	Usually	Half the time	Rarely	Never	Not applicable
Home language						
English						
British Sign Language (BSL)						
3rd language (only if there is)						

f When you and your child's other parent are together with your child, who communicates most to your child?

- You
- Your child's other parent
- Both an equal amount

Part 3: Other people in the household

14 Does your child have sisters and/or brothers at home?

- Yes
- No

a How old are your child's siblings?

b What language(s) do the siblings use with your child?

15 Besides the parents and siblings, does another adult(s) look after your child (e.g. nanny, grandmother, uncle)?

- Yes
- No

a What is the relation of this adult(s) to your child (e.g. child's aunt, child's cousin etc.)?

b What language(s) does this adult(s) use with your child?

c What language(s) does your child use with this adult(s)?

Part 4: Average day

16 Please describe who spends time with your child on an average day during the week (Monday to Friday)? Please select the relevant boxes.

	You	Your child's other parent	Siblings	School	Other adult who looks after your child	No one
7 am – 8 am						
8 am – 9 am						
9 am – 3 pm						
3 pm – 4 pm						

4 pm – 5 pm						
5 pm – 6 pm						
6 pm – 7 pm						
7 pm – bedtime						

17 Please describe who spends time with your child on an average day during the weekend? Please select the relevant boxes.

	You	Your child's other parent	Siblings	Other adult who looks after your child	No one
7 am – 9 am					
9 am – 11 am					
11 am – 1 pm					
1 pm – 3 pm					
3 pm – 5 pm					
5 pm – 7 pm					
7 pm – bedtime					

18 How many weeks per year does your child spend in the country where you child's other language(s) is/are spoken (language(s) not English)?

19 How often does your child speak English during the holidays?

- Always
- Usually
- Half the time
- Rarely
- Never

20 Please describe who spends time with your child on an average day during the holiday? Please select the relevant boxes.

	You	Your child's other parent	Siblings	Other adult who looks after your child	No one
7 am – 9 am					
9 am – 11 am					
11 am – 1 pm					
1 pm – 3 pm					
3 pm – 5 pm					
5 pm – 7 pm					
7 pm – bedtime					

Part 5: Other activities

Please note: 'Reading with an adult' includes the times that a child is being read to by an adult, as well as the times that a child tries to read on their own.

21 How often do you do activities with your child? (e.g. reading a book together, going to the park, going to the swimming pool etc.)

- Often
- Regularly
- Sometimes
- Never

22 What activities does your child do each week in their home language(s) (language(s) not English)? (Note: 'reading with an adult' includes the times when a child is being read to by an adult, as well as the times a child reads to an adult or to themselves.)

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Reading with an adult							
Using computer							
Watching TV							
Sports							
Playing with other children							

23 What activities does your child do each week in English? (Note: 'reading with an adult' includes the times when a child is being read to by an adult, as well as the times a child reads to an adult or to themselves.)

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Reading with an adult							
Using computer							
Watching TV							
Sports							
Playing with other children							

Appendix 4: Adapted SOLOM

SOLOM Parent Observation **Student Oral Language Observation Matrix**					
Child's name:					
Home language:					
	1	2	3	4	5
A. Comprehension = the ability to understand something	My child cannot understand even simple conversations.	My child has great difficulty following what is said. Can only understand when speaker speaks very slowly and with frequent repetitions.	My child understands most of what is said at a slower-than-normal speed with repetitions.	My child understands nearly everything at a normal speed. Occasional repetition may be needed.	My child's understanding is the same as children their age who speak XXX as their first language. Understands everything at normal speed and repetitions not needed.
B. Fluency = how smoothly and easily the speech is produced	My child's speech is so full of pauses and words that are pronounced unclearly that conversation is virtually impossible.	My child's speech is always disrupted. Long hesitations and pauses to produce speech lead to silent periods.	My child's speech in everyday conversation is frequently disrupted with hesitations.	My child's speech in everyday conversation is generally fluent, with only occasional periods of dysfluency.	My child's fluency is the same as children their age who speak XXX as their first language.

C. Vocabulary = number of words that a person knows	My child knows very few words, so conversations are virtually impossible.	My child knows a very small number of words and usually uses the wrong word, so conversations are very difficult.	My child knows a small number of words and often uses the wrong word, so conversations are limited.	My child knows a good number of words for their age and only occasionally uses the wrong word.	My child knows as many words as children their age who speak XXX as their first language.
D. Pronunciation = the way in which a word is pronounced	My child's pronunciation problems are so bad it is virtually impossible to understand them.	My child is very hard to understand because of pronunciation problems. My child must frequently repeat themselves to be understood.	My child's pronunciation problems mean that one must try hard to understand them and there can be some misunderstanding.	It is always easy to understand my child, although they have an accent.	My child's pronunciation is the same as children their age who speak XXX as their first language.
E. Grammar = the structure of language i.e. the way words are used and put together	My child makes so many grammar errors that it is virtually impossible to understand them.	My child's grammar errors make them very difficult to understand.	My child often makes grammar errors which can sometimes make it difficult to understand them.	My child sometimes makes grammar errors, but it is possible to understand them.	My child's grammar is the same as children their age who speak XXX as their first language.