



THE BENEFITS OF EARLY ACCESS TO SIGN LANGUAGE FOR DEAF CHILDREN: AN EVIDENCE BRIEFING.

Professor Alys Young
Dr Katherine Rogers
Dr Kate Rowley
Robyn Swannack

This work was commissioned by
the British Deaf Association

INTRODUCTION

- Introduction
- Briefing Structure

Introduction

This evidence briefing was commissioned by the British Deaf Association. It is about **what the research evidence tells us about the benefits of early access to sign language for deaf children.**

- **‘Benefits’** does not just refer to language development. It can also mean benefits later in life such as mental wellbeing and general health.
- **‘Sign language’** refers to natural languages such as BSL (British Sign Language). The focus is not on visual representations of spoken language such as SEE (Signing Exact English), Sign Supported English (SSE), Total Communication, or Makaton.
- For purposes of this briefing, **‘early’** means under the age of 5 years, although some studies on which we draw will include slightly older children because of how the studies are carried out.

The briefing is intended to be accessible to a non-specialist audience. It is not a formal academic scoping review. However, the ways in which we identified the relevant literature to include followed a strict protocol and, in the future, a formal research paper will be published. For more information about the method see Protocol Registration: INPLASY2024110040; <https://doi.org/10.37766/inplasy2024>.

The briefing document only includes published research. Some of the included publications are research studies that set out to investigate a specific research question. These studies are important in showing whether there is clear evidence for benefit or not. Some of the included publications are evidence-based reviews that pulled together a lot of other studies around a specific topic. These provide important background information about the benefit of sign language in the early years. We also include clear statements about what is not researched and the gaps in evidence that exist. We do not include publications that are just based on people’s views and

opinions. We do not make any recommendations. *This evidence briefing is intended as a resource for others who wish to have quick access to a range of relevant evidence for their own purposes.*

The briefing has been produced by four scholars from two specialist university research departments in the UK: Professor Alys Young, Dr Katherine Rogers, Dr Kate Rowley and Robyn Swannack. Three are Deaf academics, one a hearing sign bilingual academic. More details about their work can be found here:

SORD, University of Manchester: <https://sites.manchester.ac.uk/sord/>

DCAL, University College London: <https://www.ucl.ac.uk/brain-sciences/pals/research/deafness-cognition-and-language-dcal>

Briefing structure

Section One provides some general information about the context in which deaf children might gain early access to and begin developing sign language early in life. This baseline is important for understanding the background to the research evidence that will be reviewed.

Section Two addresses the specific research evidence available in relation to the benefits of early access to sign language for a range of topics. These are:

- (i) Language development
- (ii) Cognitive development
- (iii) Social-emotional development
- (iv) Literacy, addressing the foundations for reading and writing
- (v) Health and wellbeing comprising both mental and physical health

Each of these topics is presented according to the same structure:

- What are the background issues that are relevant to all children?

- What are the challenges that deaf children might face?
- What is the evidence for the benefit of early access to sign language?

Section Three offers some summary conclusions about the benefits of early exposure to sign language alongside some wider observations about the quality of evidence available.

Section Four brings into one list the references to the available evidence cited in the main text are provided which are also collated at the end.

Although each part can be read as a standalone briefing, they are intended to be read in sequence.

SECTION ONE: GENERAL BACKGROUND

- Why focus only on the benefits of early access to sign language for deaf children?
- Differences in home language environment
- All children need access to good language in order to develop
- Sign language fluency in early and late signers
- Families

Why focus only on the benefits of early access to a sign language for deaf children?

1. ***Very few people ask this positive question about the benefits of early sign language.***

It is much more common to do research about solving the problems that ‘deafness’ causes for children and families. It is much rarer to ask a positive question about what might advantage deaf children. Sign language is the natural language of over 72 million Deaf people worldwide (National Geographic Education, 2024). Therefore, asking about how and why early access to a sign language might be a benefit for deaf children is an important one.

2. ***The weight of available evidence is skewed.***

Far more research is carried out on the effectiveness of what is centrally funded for deaf children in the UK (e.g. hearing aids, cochlear implants) rather than what is not (e.g. sign language support for hearing families with deaf children). This difference matters because of how many fewer studies take place about the benefit of sign language compared with spoken language and hearing devices. Often greater credibility is given to topics where there seems to be more studies and more evidence. A lack of evidence or weaker evidence may simply be the result of in-built bias in what is funded, not because some evidence is better than others.

3. ***The benefits of early sign language are often viewed in comparison with spoken language, or with the profiles of typically developing hearing children rather than considered in their own right.***

A lot of research divides participant subjects into categories such as ‘oral’ or ‘signing’ children and then makes comparisons between them. Far fewer studies explore the developmental advantages for deaf children of growing up with sign language as its own topic worthy of being understood.

4. ***There are few studies of long-term outcomes for deaf children that include whether a deaf child had early exposure to sign language.***

It is much more common for studies to examine the relationship between a deaf person's current language skills/preferences and outcomes such as employment, health, education etc. Examining the consequences of a deaf person's **early** language profile is much rarer. (E.g. did they grow up with early sign language? Did they only have access to spoken language? Did they experience language deprivation?). This means evidence for the benefits of early access to sign language on later childhood or adulthood is hard to show.

Differences in home language environment

Before reviewing the evidence about the benefits of sign language in the early years it is important to think about the very varied kinds of language environments in which deaf children grow up. In countries of the developed world¹, such as the UK, between 1 and 2 children per 1000 are born deaf (Gov UK, 2019) or become so in the first few years of life. Only around 5% of these children will have one or more parent who is also deaf. This means that the usual pattern of parents passing on their language to their children from one generation to the next is rare for deaf children unless they have deaf parents.

Although the UK is becoming a much more multilingual country (e.g. ONS, 2021), the vast majority of all children will still grow up in monolingual households. This means the percentage of born deaf children who will have families who are used to using more than one language (whether spoken or signed) in everyday family life is also small. In families with multiple children, it is usually the case that only one child will be deaf. An exception would be families with genetic roots for their children's deafness. This means most deaf children grow up as the only deaf person in their family.

¹ The incidence of early childhood deafness in the majority of countries of the developing world is much greater. We acknowledge that 90% of deaf children will reside in those countries (WHO, 2021) but the evidence we draw on in this briefing is mostly from post-industrial nations.

Although in a country such as the UK, parents are provided with information about a range of possibilities and options to support their deaf child, including bring up their child with sign language, the vast majority of hearing parents choose to use spoken language only. Most Deaf parents who use sign language will bring up their children (whether deaf or hearing) using sign language as a first language. This means that the vast majority of deaf children in the early years will only have access to spoken language (supported by hearing devices including cochlear implants if appropriate).

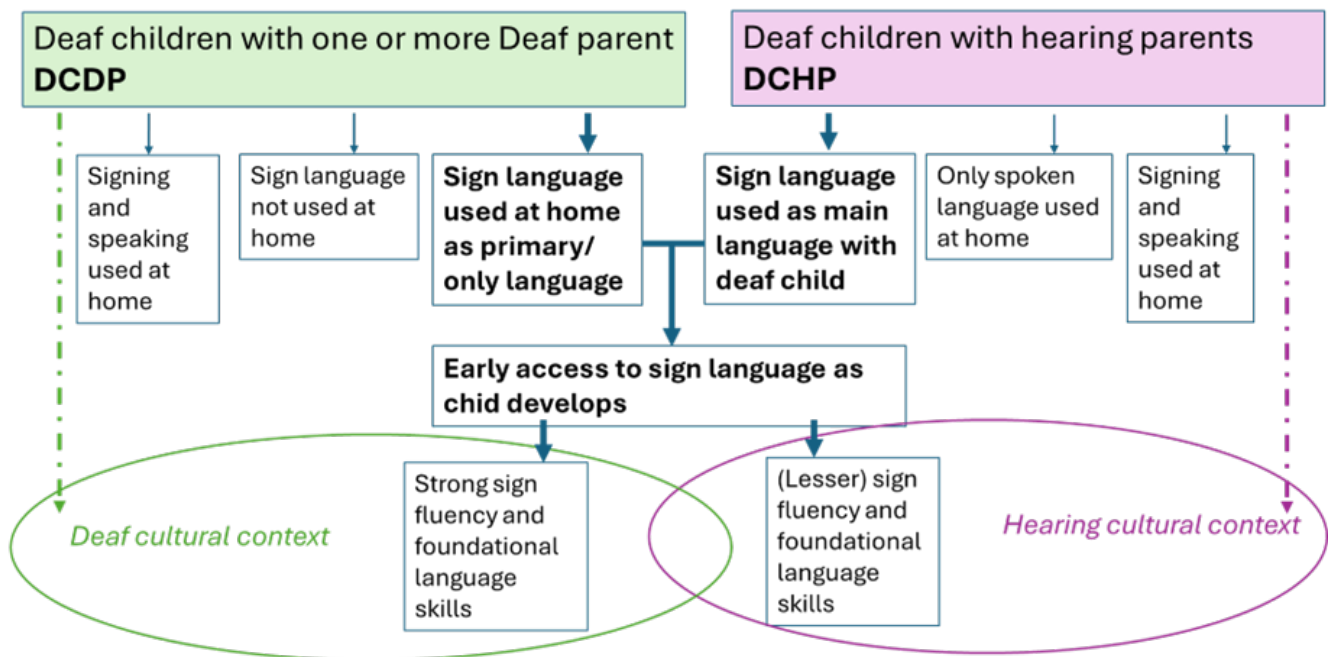
A minority of hearing parents will seek to bring up their deaf child with sign language in early childhood. Some do this at first and later change to spoken language only e.g. after their child has had a cochlear implant. Some continue learning to sign as their child develops. Not all parents and caregivers will attain a good standard of fluency in sign language. This means that there is great variation in the quantity and quality of sign language available to deaf children in the early years if they are in hearing families learning to sign themselves.

These five points are important in understanding the heterogeneity in the kinds of language environment a deaf child might experience at home in the early years and variability in access to early sign language:

1. Scarcity of intergenerational transmission of sign language and deaf culture
2. Mostly monolingual language home environments
3. Commonly the deaf child is the only deaf person in the family
4. Mostly deaf children grow up only with spoken language
5. Variability in the quantity and quality of language available to the developing deaf child

This can be summarised in the diagram below:

Different **populations** of children in early sign language acquisition period



In looking at the research evidence about the benefits of early access to sign language it is important to check how variations in the home environments of deaf children have been taken into consideration (or not).

All children need access to good language in order to develop

To acquire a first language, all children (whether deaf or hearing) need to be exposed a rich language environment (Finders et al., 2023). A rich environment has both quantity (lots of language in it) and quality (good users of the language the child will acquire and language that is varied) (Anderson, N. et al., 2021). Deaf children are no different.

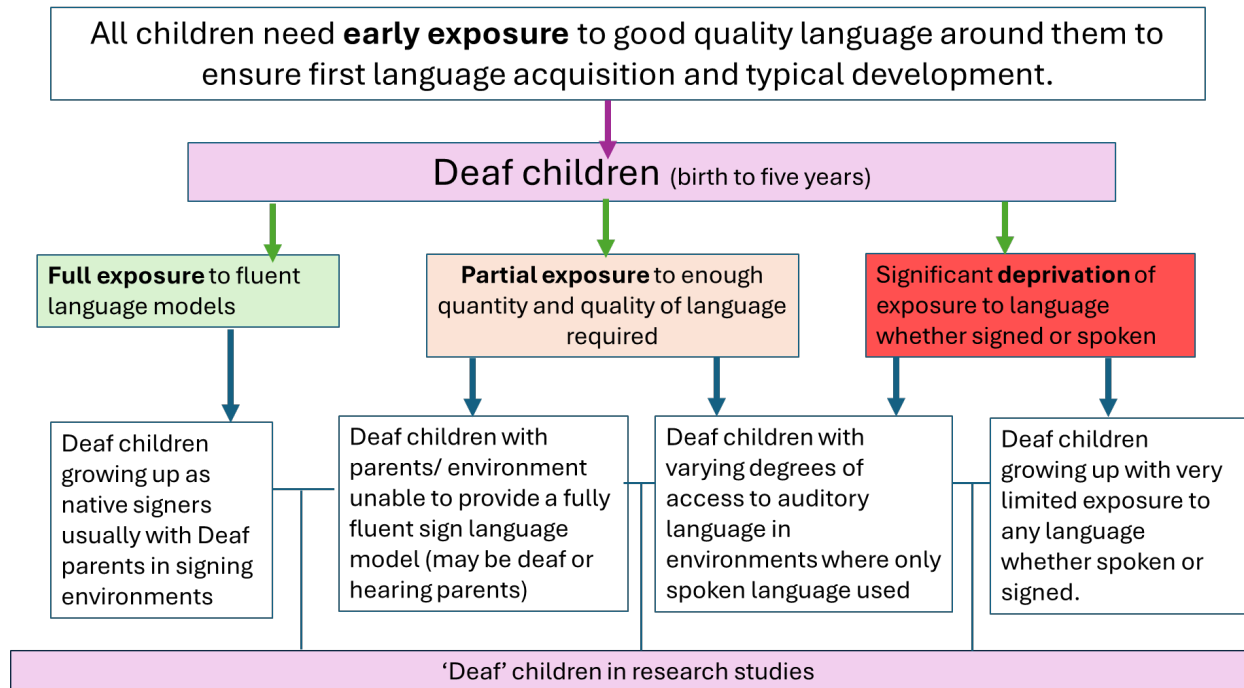
Many research studies have shown over many years that deaf children who grow up in signing environments with good quality sign language can and do develop language on a par with hearing children growing up in typical spoken language environments (Petitto, 2000). This mostly applies to deaf children with deaf parents and these children are sometimes referred to as 'native signers'. There is increasing evidence however that non-native models of sign language from hearing parents are nonetheless significantly beneficial to deaf children (see Language Development section).

Most deaf children have hearing parents with no previous experience of, or fluency in a sign language. Consequently, one of the biggest arguments people put forward against the benefits of early exposure to sign language for deaf children is that it is simply not realistic. It is suggested that even those parents who commit to learn to sign and ensuring their child is growing up with exposure to visual language are unlikely to be able to create a good enough first language model. Just because deaf children acquire age-appropriate language if they have deaf parents does not mean that they will if they have hearing parents who are signing. What is interesting about this argument is that it is rare to come across its opposite: just because a deaf child has excellent hearing devices and growing up in a spoken language home this does not mean they will access a good enough first language model to develop typical age-appropriate language. Yet it is well known that language deprivation and language deficits persist for deaf children who grow up with spoken language (Hall, Hall and Caselli, 2019).

In considering the benefits of early access to a sign language it is vitally important to consider the influence of the environment in which the child is developing and whether there is early access to sufficient exposure to good enough sign language for the child to benefit. This does not necessarily need to be a fluent model of sign language in the early years (see section on language development).

In looking at the research evidence it is important to check whether these variations in exposure to and quality of signed language in the early years have been taken into consideration. It is not just about whether a child has deaf or hearing parents.

These differences can be represented diagrammatically:



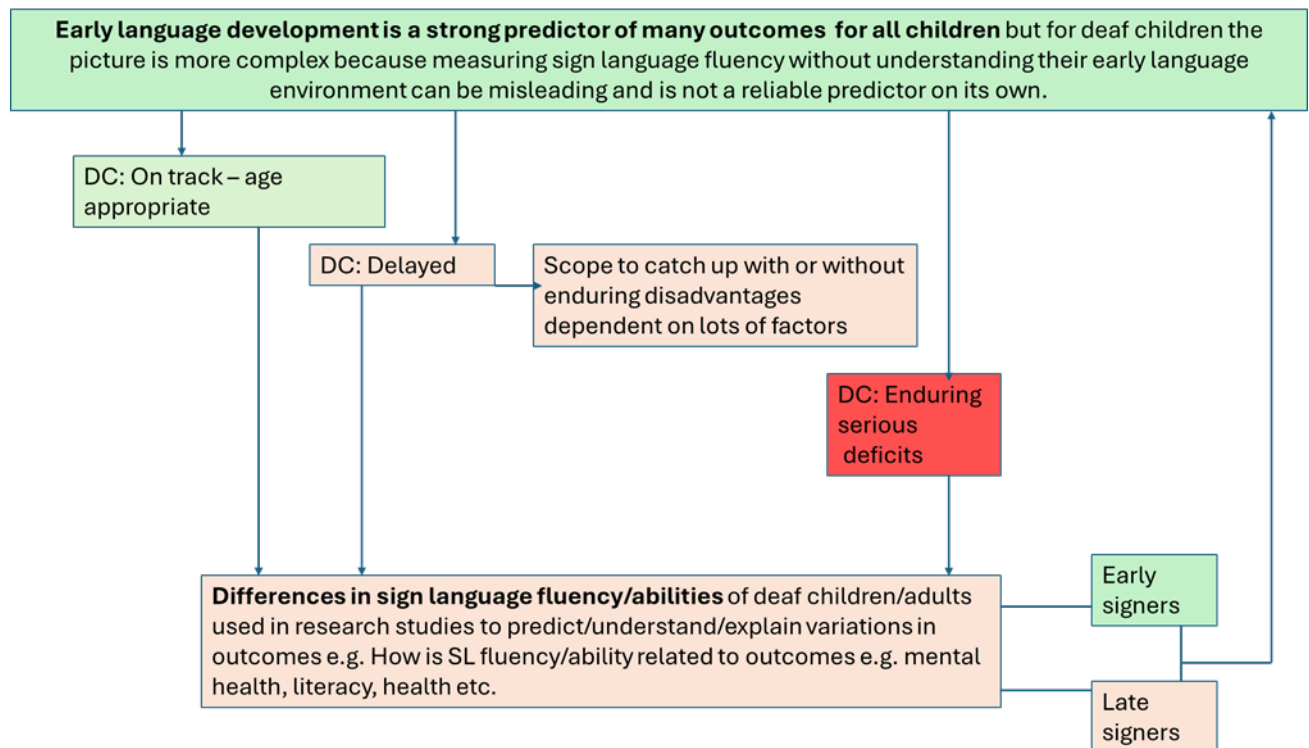
Sign language fluency and early and late signers

Timing is another key consideration in exposure to sign language in the early years.

Some deaf children who are signers in later childhood and into adulthood might not have had any access to sign language in the early years. Research generally classifies them as 'late' signers but not all studies make the distinction between early and late signers. It is very common for research studies to simply measure the fluency of a child's (or adult's) sign language in the here and now then investigate the relationship between signing skills and whatever outcome is being studied. For example, does the sign language proficiency of an 8-year-old child predict how well a child reads? How good are the pragmatic skills of 10 years old deaf oral children in comparison with 10 years old deaf signing children? The key problem with these kinds of studies, is that sign language skills are also related to whether a child or adult is an early or late signer – usually referred to as age of acquisition (AoA). We know from studies of early and late signers that there are differences in how well a child or adult is able to gain fluency in the language, and use different components of grammar.

When looking at the results of studies that test deaf 'signers' against deaf 'non-signers' it is very important to consider if the results also factor in whether a child or adult is an early or late signer. Many do not.

These issues of early and late signers and how the effects are considered in research studies can be represented diagrammatically: (DC means Deaf Child)



Families

The final background issue, in considering the benefits of early access to sign language, is that deaf children do not develop in isolation. They grow up in a wide diversity of homes, families, and communities, some of which will include non-traditional and alternative care-giving structures with a wide definition of who might be ‘family’ (Sass-Lehrer and Young, 2016). Many features of parenting, the developmental environment, and the wider society in which a child grows up will also affect early access to a sign language (Szarkowski et al., 2024). For example: parents’ values, beliefs and attitudes toward deafness and sign language (Young and Tattersall, 2007; Young et al., 2009); whether the area in which they live can provide access to sign language for their child and the attitudes of professionals towards this (Matthijs et al. 2017; Young et al., 2006);

the impact of socio-economic resources on what a family might be able to do in order to support their child (Young et al., 2006), access to other parents of deaf children (GPODHH undated); access to deaf people including deaf signers (Joy et al., 2025).

The point is that a deaf child's early access to sign language is influenced by many factors some of which are within the control, and some out of the control, of parents. For potential benefits of early access to sign language to be realised requires also the support of parents and families, the availability of access to deaf signers, the resources to support families' access to sign language in cases where parents are not deaf, and comprehensive early intervention to enable such a start to occur that makes a signing pathway an equitable and realistic choice for children and families (Rowley, Snodden and O'Neill, 2022). It is outside of the scope of this review to examine these features in any detail, but we point it out as a fundamental background condition. Its variability will affect the extent to which the benefits of early access to sign language for deaf children and their families can be unlocked.

PART TWO: EVIDENCE FOR THE BENEFIT OF EARLY ACCESS TO A SIGN LANGUAGE FOR SPECIFIC TOPICS

- Language development
- Cognitive development
- Social-emotional development
- Literacy
- Health and Wellbeing

LANGUAGE DEVELOPMENT

Some background issues that apply to ALL children

All children need exposure to a natural language in early infancy because this triggers the language acquisition process. Deaf children are no different (Humphries et al., 2012). There is a sensitive period (birth to five years) in which the acquisition of a first language is optimal (Hartshorne, Tenenbaum, and Pinker 2018).

Mastery of at least one first/primary language (whether spoken or signed) in the early years is the core foundation for all children of cognitive, social-emotional development, school readiness, literacy and academic outcomes (Hall et al., 2019). This has knock-on effects in later life for employment, socio-economic status, life chances, health outcomes and wellbeing.

To acquire a full first language every child needs to be exposed to sufficient *quantity* and *quality* of a natural language. This is true of spoken and signed languages – there is no difference (Petitto, 2000). Quantity means how much language is available. Minimal language will not be enough to support language acquisition. Quality means three things: (i) interactional quality e.g. turn taking, joint attention between parent and child whilst communicating; (ii) linguistic quality e.g. how rich the language input is in terms of vocabulary, complexity of expression and syntax; (iii) perceptual quality e.g. how much of the language communicated to a child can that child perceive (whether visually or auditorily) (Hall et al., 2019).

Sign languages, language acquisition and development

Over 40 years of research has demonstrated that sign languages are acquired and used in the same way as spoken languages (Humphries et al., 2012). There is no evidence to support the assumption that the human brain is hardwired (biologically or neurologically) for the acquisition of spoken language. It is just ready for language, of whatever modality (Humphries et al., 2012; Petitto, 2000). This means that typical language acquisition does not require the presence of speech and sound. It simply requires the presence of language.

Studies of deaf children with deaf parents who grow up with sign language from birth consistently show a pattern and rate of sign language acquisition that follows a parallel trajectory to that of typically developing hearing children acquiring a spoken language (Anderson and Reilly, 2002; Chamberlain, Morford and Mayberry, 2000; Meier, 1991; Morgan, 2015; Newport and Meier, 1985; Petitto, 2000; Schick, Marschark and Spencer, 2005). This means that children develop features of language such as vocabulary, grammar and storytelling in very similar ways and timing, whether they are learning a spoken and/or a signed language (Rowley, 2020).

There is nothing about visual, spatial, gestural sign languages that of themselves cause delays or deficits in language development provided a child has sufficient exposure to a sign language at the right age (Lu, Jones and Morgan, 2016).

There is no good evidence that sign language acquisition will create detrimental/poor spoken language outcomes for deaf children (Fitzpatrick et al., 2016).

Challenges to deaf children's language development in the early years

It is very rare for deaf children to have full access to a natural language model (whether spoken or signed) in the crucial early years of language development. This is because even sophisticated hearing aids, or Cochlear Implants, do not assure unimpeded access to spoken language. For example, some deaf children may have little or no access to spoken language whilst waiting to be implanted. Simply putting on hearing aids early in a child's life without parents being supported how to modify their interactions with their child will not optimise how much spoken language a child can perceive. Also hearing parents who are only just learning to use sign language are unlikely to provide exposure to fluent age-appropriate signing to meet the child's developmental needs (Krebs et al, 2021; Schick et al., 2005).

Consequently, the vast majority of deaf children will experience delayed, sub-optimal or deficient language input in the early years of life to a greater or lesser degree, regardless of whether spoken or signed language is available to them (Pierce et al., 2017). This is

increasingly referred to as language deprivation (Hall, W.C., 2017; Hall, Levin and Anderson, 2017; Humphries et al., 2016a, 2016b.). An obvious exception to this is deaf children with deaf parents growing up in signing environments, but this applies to only around 5% of deaf children (Mitchell and Karchmer, 2004) and having deaf parents does not alone guarantee optimal language development (Hall et al., 2017).

Therefore, the majority of adult deaf signers are not exposed to natural sign language in early infancy (Lu et al., 2016; Morford, 2002; Pierce et al., 2017) with many acquiring their sign language later on at school or in later childhood through friends and socialisation or even later in adulthood. For some it becomes their primary language, but not one that has been acquired in infancy.

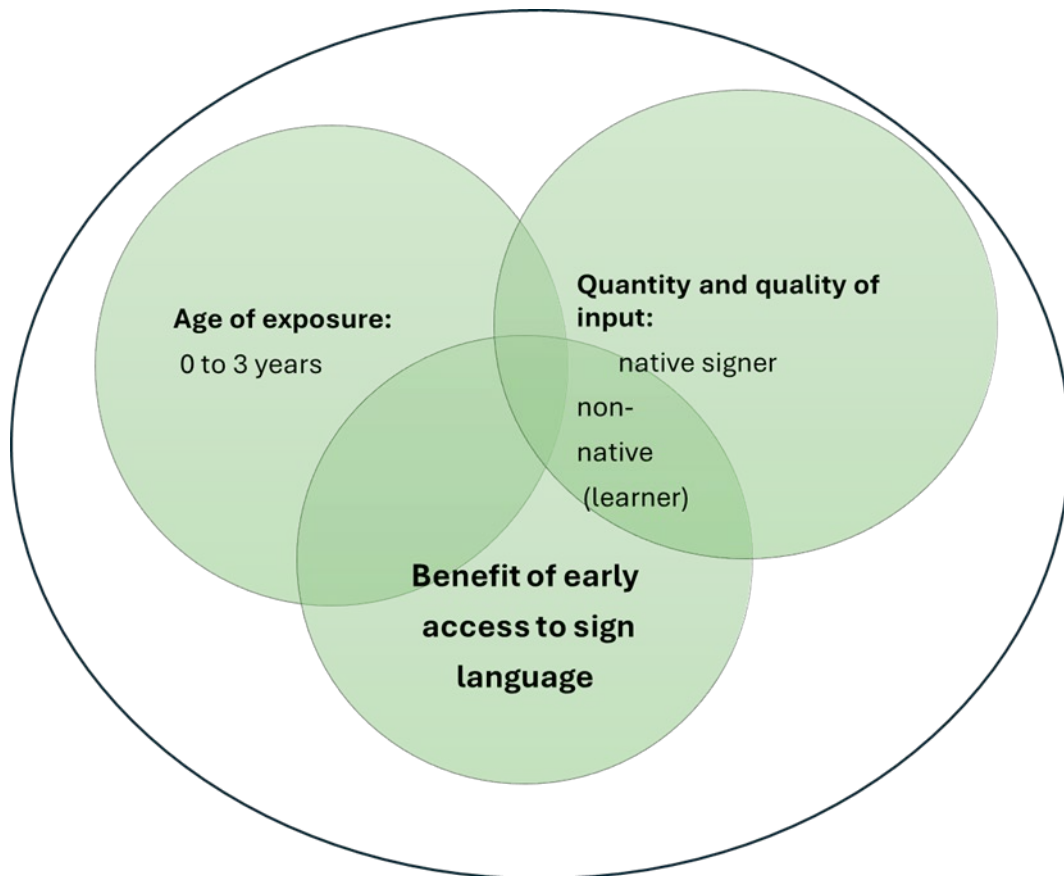
Many studies show the negative impacts of ‘late’ acquisition of a sign language on aspects of sign language grammar, fluency, language processing and comprehension with late signers generally making more errors and being less accurate in both the production and comprehension of signed language. (A good brief review of this research can be found in Krebs, 2021, p.398-399. See also Corina et al., 2020; Mayberry, 1993; Mayberry and Kluender, 2018).

Those who do not achieve age -appropriate mastery of any language in childhood rarely achieve it in their lifetime (Hall et al., 2019 for review). For late deaf signers, the length of time they have been signing (the length of language experience) is not related to their sign language proficiency. A late signer who has been signing for 30 years is not necessarily more or less proficient than a late signer who has been signing for 10 years. There is not a direct correlation. (Corina et al., 2020; Mayberry and Eichen, 1991; Newport, 1990).

The benefits of early access to a sign language on deaf children’s language development

The potential benefits of early access to a sign language for deaf children's language development are, therefore, moderated by (i) age of exposure to a sign language and (ii) quantity and quality of input.

This can be represented diagrammatically:



2

Given the sensitive period for language acquisition, early exposure to a sign language should be seen as a *protective factor* against the effects of linguistic deprivation consequent on delayed onset of any language exposure (Delcenserie et al., 2024). This is because deaf children have an innate capacity to access a natural sign language because it not sound-dependent. The issue is not ability, but rather opportunity to do

² We refer to age of exposure as 0 to 3 years in this diagram rather than 0 – 5 years because the critical period for some aspects of language acquisition is in this early period.

so. Consequently failure to provide the opportunity to be exposed to a natural sign language is as an “unacceptable risk” (Hall et al., 2019) because it takes away one potential and accessible source of language exposure during the critical language acquisition period. Hall et al. (2019) conclude, from an extensive review of research studies, that: “Providing access to a natural sign language increases a deaf child’s chances of attaining global language proficiency – which in turn promotes healthy outcomes in cognitive, academic, and socioemotional development, among others.” (p, 383).

Deaf people who are exposed to sign language at an earlier age, in comparison to those exposed at a later age, do better on tests of sign language processing and sign language knowledge (Petitto, 2000). Many studies show that individuals who are exposed early to sign language in comparison with those who are exposed later, will do better in the acquisition of first and second languages whether those are signed or spoken languages (Morford and Mayberry, 2000).

However, the benefits of early access to a sign language are moderated by the quality of the input of that language (Pierce et al., 2017; Schick et al., 2005). For example, restricted exposure to fluent models of sign language in the early years can result in Working Memory delays and deficits (Marshall et al., 2015). [see cognitive development section]

Deaf children with deaf parents have been found to have larger vocabularies than deaf children with hearing parents exposed to sign language in the early years (Lu et al., 2016). However, the hearing/deaf status of parents has been found to be of less significance than parents’ signing skills. In a study including 44 deaf children aged 8 to 60 months all of whom had hearing parents who were learning ASL, parent ASL proficiency was found to be a significant predictor of child ASL vocabulary size (but this effect was not observed in toddlers, children under 24 months) (Berger et al., 2024). This suggests that as children grow older, the extent of sign language proficiency of their parents becomes more important. Despite the variability in parents’ sign language

proficiency in this study, children of the most skilled parents had age-expected vocabularies even though their parents were not as fluent as native deaf signers.

In another study (Caselli et al., 2021) of 78 deaf children between the ages of 8 and 68 months from hearing families who were learning ASL, the authors found that deaf children who were exposed to ASL in the first six months of life had age-expected receptive and expressive vocabulary growth. Children who had a short delay in ASL exposure (6 to 36 months) had relatively smaller expressive but not receptive vocabulary sizes, however they made rapid gains. The authors conclude that although hearing parents generally learn ASL alongside their children who are deaf, their children can develop age-expected vocabulary skills when exposed to ASL during infancy.

Children who are deaf with hearing parents who use sign language can predictably and consistently develop age-level vocabularies at rates similar to native signers.

Furthermore, early vocabulary skills are robust predictors of development across many domains of linguistic and cognitive development. However in a study of early language delay (ELD) amongst deaf children aged 3 to 5 years comparing deaf children of deaf parents and deaf children of hearing parents who used sign language (Hall et al, 2017), 47.6% (70/147) DOH children were found to have a 2 year ASL language delay in comparison with 28.7% (50/174) DOD children.

There has been an increasing amount of research about the impact of early exposure to sign language on the spoken language abilities of deaf children who have a Cochlear Implant (CI). Some of this research is on deaf children with deaf parents who are 'native signers' and some is about deaf children exposed to 'non-native' signing by their parents. These studies have demonstrated a clear benefit for deaf children of having access to a sign language prior to implantation (Berger et al., 2024; Davidson et al., 2014; Delcenserie et al., 2024; Goodwin and Lillo-Martin, 2019; Hassanzadeh, 2012; Pontecorvo et al., 2023).

In one study of deaf CI children exposed to non-native sign language, those with more exposure to sign language (before and for a few months post-implantation) did not differ significantly on measures of spoken language development with age-matched typically hearing children. They scored significantly higher than deaf CI children with short exposure to sign language (prior to implantation only) and deaf CI children with no exposure to sign language. In tests of working memory the same pattern was found. In other words, exposure to sign language, even non-native sign language, before and for some time after implantation, has a positive impact on deaf children's spoken language and working memory abilities (Delcenserie et al., 2024). In another study of deaf CI children, aged 8 – 60 months, who acquired ASL and English bilingually from hearing parents, they had total vocabularies from both languages combined that are similar to monolingual speakers of English (Pontecorvo et al., 2023).

There has been recent interest in the impact, if any, of early exposure to sign language on the ageing process in deaf adults. One question is whether the age of acquisition of sign language matters alongside how long someone has been a signer. Research is starting to show that in deaf adults over the age 50, native signers and those who acquire sign language in early infancy perform better than late signers in some sign language performance tasks such as sentence repetition (Corina et al., 2020) but not necessarily in other linguistic domains such as syntax (Krebs et al., 2021). However, early acquisition of a sign language does not have a protective effect on age-related decline in language processing (Corina et al., 2020). But then why should it? Early acquisition of spoken language for the hearing population does not have a protective effect.

COGNITIVE DEVELOPMENT

Some background issues that apply to ALL children

The early years lay the foundations for cognitive development in domains such as Working Memory (the ability to encode, store, manipulate and recall information), Executive Function (the skills necessary to achieve a goal including planning, holding and processing information, flexible thinking) and Theory of Mind (the ability to recognise, understand and predict the thoughts, feelings, perspectives and actions of others). Good cognitive development and functioning in domains such as these are crucial for all children's academic and social-emotional development, and confident navigation of the world around them. For all children, cognitive development is inherently connected with language development. When children do not have sufficient exposure to a native language (whether signed or spoken), this has negative consequence for cognitive skill development in general (Marshall et al., 2015). All children require access to good quality early language to stimulate cognitive development. Deaf children are no different.

Challenges to deaf children's cognitive development in the early years

A recurring question is whether it is deafness that impacts deaf children's cognitive development in the early years or whether it is the extent of language experience? Some researchers argue the 'auditory deprivation hypothesis'. This suggests that auditory stimulation is crucial to brain development. Consequently, deficits in exposure to sound and the linked delays in access to spoken language can have a negative impact on cognitive skills development (Kral et al., 2016). It is suggested that this explains deficits and delays in cognitive functioning observed in many young deaf children. Other researchers argue that the development of cognitive skills is highly dependent on exposure to a rich language environment early in life (Delcenserie et al., 2024; Kotowicz et al., 2023; Marshall et al., 2015), not necessarily to sound. Consequently, deafness per se does not present challenges to cognitive development but rather inadequate exposure to rich enough language is the problem; known as the 'language deprivation hypothesis'. Many studies of native signers' cognitive skills have helped to start to separate out these two different points of view; in itself a clear contribution that the study of sign language makes to knowledge about cognition.

Several studies have shown clearly that deaf native signers with deaf parents growing up in a rich sign language environment do not experience significant cognitive deficits despite lack of exposure to auditory stimulation (Kotowicz et al., 2023). However, this still leaves the question of the impact on cognitive development of deaf children growing up with non-native signing and whether that is better, worse or comparable to deaf children growing up orally with little or no exposure to early sign language. This is included in the summary below of the benefits of early exposure to sign language for cognitive development.

The benefits of early access to a sign language on deaf children's cognitive development

Several studies have demonstrated that early access to sign language provides significant cognitive and neurological advantages (Botting et al., 2017; Courtin, 2000; Delcenserie, 2024; Mercure et al., 2020). In part this is because of the roles sign language can play in avoiding language deprivation, even in children exposed to non-native signers. In part, it is because of specific visual, spatial, properties that are inherent to how sign languages work that can support and scaffold some features of cognitive development.

Deaf native signing children who are exposed to quality early sign language perform similarly to or in some cases out-perform their hearing peers on tasks assessing Executive Function (Kotowicz et al., 2023), Working Memory (Goodwin et al., 2022; Hall et al., 2017, 2018) Non-verbal Working Memory (Marshall et al., 2015), and Theory of Mind (Courtin, 2000). Proficiency in sign language plays a key role in the development and enhancement of Executive Function (Botting et al., 2017; Delcenserie et al., 2024) and sign language knowledge and skills have been found to *predict* Executive Function skills in deaf children (Kotowicz et al., 2023).

Research consistently demonstrates that deaf children with deaf parents outperform deaf children with non-signing hearing parents. For example, in a study of deaf children with cochlear implants, deaf children growing up with native signers did much better in

tests of reasoning, knowledge, visual special processing and working memory (Amraei et al., 2017).

There are differences, however, in the impact on cognitive development for deaf children exposed to non-native sign language in the early years. In a study of non-verbal working memory, non-native signers did not do as well as native signers (Marshall et al., 2015) but the researchers conclude that delays in language acquisition and language deficits are likely to be more significant in explaining this result than kind of language model (non-native signing). In a study of Theory of Mind, although signing children (age 5 to 8 years) of hearing parents did not do as well as deaf children of deaf parents, they nonetheless outperformed oral deaf children of non-signing hearing parents (Courtin, 2000). Although early exposure to native signing is found to have a strong impact on the development of Theory of Mind, evidence suggests that even late exposure to a sign language (including a non-native signing model) can lead to faster catch-up in Theory of Mind development than exposure to a solely oral language (Courtin, 2000, p. 273).

There is increasing evidence, therefore, that early exposure to a linguistic system combined with the use of a sign language (whether native or non-native exposure) is the most favourable situation for the development of key cognitive skills such as Theory of Mind and Working Memory in comparison with an early developmental situation with severely impoverished language exposure leading to language deprivation.

A different strand of research on cognitive development has explored whether there are any inherent advantages in how sign languages work that might provide benefits for the development of key cognitive skills. For example, Theory of Mind requires capacity to perceive and understand the perspective of others and predict feelings and actions. It has been argued that three specific features of sign language grammar and expression support an earlier grasp of this conceptual skill (Courtin, 2000). For example, to 'read' another's signing requires the person to reorientate linguistic space to understand the signed message from the other's point of view. This is because we sign from our perspective, but this is reversed for a person seeking to understand what is being said.

Some expressions of verbs require the visual representation of both subject and object in the same signing space – sometimes referred to as spatial mapping. Signing space may be sub-divided to represent different persons and points of view within a single narrative as in for example, role shift in storytelling. Deaf signing children as young as 3 years have been found to have understanding of these grammatical, expressive forms of representation that include the development of perceptual skills associated with the perspective (Courtin, 2000). This may be in part why deaf native signers have advanced Theory of Mind skills as advanced perceptual skills ease the transition to the conceptual skills required for Theory of Mind development.

In general, recognising iconicity is also an important cognitive skill – it refers to the ability to understand the relationship between the form and meaning of an iconic symbol (or gesture) e.g. understanding meaning of emoticons, and picture books. In early development, iconicity skills help children form associations between words they have learned and the physical objects or actions they represent (Johnson, 2021). This raises the question whether the inherent iconic properties of some aspect so sign language help with early cognitive developmental skills? Magid and Pyers (2017) found that although deaf preschoolers with early access to sign language had similar patterns of recognition and recall of iconic gestures as hearing children, these patterns emerged at an earlier age. In other words, early exposure to sign language may accelerate the development of a child's sensitivity to iconicity that is advantageous to cognitive development and learning the relationship between vocabulary and physical world/objects to which it relates.

SOCIAL-EMOTIONAL DEVELOPMENT

Some background issues that apply to all children

The development of social and emotional skills begins at birth and how children understand the world and themselves is influenced by their early experiences (Halle and Darling-Churchill, 2016). Social-emotional development refers to a child's ability to create and maintain relationships with others, ability to express and manage their own emotions, and respond appropriately to others' emotions (Head Start, undated). Social-emotional development is closely linked to the quality of relationships with caregivers, the responsiveness of parent-child interaction, bonding and attachment, and the range of social encounters in the child's developmental environment as well as inherent factors in the child's temperament (Thompson and Virmani, 2012). Healthy social-emotional development in early childhood is the foundation of good early childhood mental health. Linguistic and cognitive development are closely allied with social-emotional development because of the influence of how a child might feel about themselves and their capacity to express emotions and ideas.

The original Early Support Monitoring Protocol for Deaf Babies and Children (DfES, 2006)³ set out milestones for social-emotional development in parallel with those for the development of communication and language (both in BSL and in spoken language) arranged by age- appropriate indicators in the categories of: Self-other awareness; social-emotional expression; attachment; imitation; and knowledge of social scripts (pp 52-66). Children with good social-emotional developmental skills are more able to (Reinsberg, undated):

- Express their ideas and feelings
- Display empathy towards others
- Manage their feelings of frustration and disappointment more easily
- Feel self-confident
- More easily make and develop friendships
- Succeed in school

³ Note, this is the second edition of the original DfES document. It is **not** the amended version reproduced as "Success from the start" (NDCS, undated)

Adverse Childhood Experiences (ACEs)⁴ can negatively affect social-emotional development which can contribute to later mental and emotional health problems (Malik and Marwaha, 2022). The Department of Education (UK) acknowledges the importance of personal, social and emotional development to lead healthy lives (DoE, 2024).

Challenges to deaf children's social-emotional development

In early childhood, when an infant's needs are met by adults, they are able to better regulate their emotions, pay more attention to their surroundings, and develop secure relationships. However, this can be challenging for deaf children whose communication needs may not be consistently met whether because of impoverished auditory access to spoken language or because hearing parents are just learning to sign and those skills are more likely to be poorer than those of native signers (Deaf parents). In addition, deafness can interfere with usual patterns of interaction between parents and their child (e.g. child-led responsiveness, joint attention, relational, emotional expression). Such early interaction is crucial for the development of the child including their social-emotional development even before the development of formal language.

Challenges arise in the building of reciprocal and satisfying parent/child relationships if parents are not well attuned to the needs of a child who responds best through a visual rather than auditory medium. The use of sounds (such as soothing, singing, baby talk etc.) in the early forming of relationships are less accessible to a deaf child. Adaptive behaviours by hearing care givers with deaf children may also be far less effective (for example hearing mothers using spoken language are found to be more directive, intrusive and less responsive with their deaf children in comparison with hearing mothers with hearing children (Morgan et al., 2014). Parents who are just learning to sign may do so in ways that the child does not optimally 'see' the signing as it outside of field of vision or disconnected with what it relates to in the world around them (Loots,

⁴ ACEs are defined as traumatic and frequently occurring stressful events that children experience including various forms of abuse, neglect violence between parents/caregivers and alcohol and substance abuse in the family as well as peer or community/collective violence (WHO, 2020).

Devise and Jacquet, 2005). Parents' concentration on the development of audition and emphasis on sound might cause them to not recognise or enjoy the early non-verbal communicative abilities of their children, which is a usual stage in all infants' development.

Benefits of early access to sign language for social-emotional development

Social interaction assists with the development of a sense of self, but if language development is delayed, it is challenging to develop a positive sense of self especially when experiencing communication difficulties with key caregivers (Obrzut et al., 1999). A review carried out by Obrzut et al. (1999) reported that deaf children with deaf parents show better self-concepts than those with hearing parents. Self-concept refers to the beliefs and perceptions we hold about ourselves including our self-image, self esteem and appraisal of our strengths and weaknesses. It is important because it affects motivations, behaviours and attitudes.

One of the drivers for universal newborn hearing screening, is that early identification of deafness when combined with early intervention, is not just beneficial for language development but also for social-emotional development; delays in one are correlated with delays in the other (Yoshinaga-Itano, 2003). Intervention with parents in the first few months of life can, in part, be attuned to refining deaf child/parent interaction, supporting awareness of non-verbal communicative exchanges and developing responsive parenting (DfES, 2006). This is a clear advantage of newborn hearing screening in comparison with previous times when a parent might not know their child is deaf until two or three years old and less effective patterns of mutual interaction were already established (Young and Tattersall, 2007).

Social-emotional development, however, is not just dependent on language development. It is also fundamentally entwined with the development of the sense of self which encompasses not just awareness of the other in relation to the self but also patterns of interaction, some of which require the development of what can be termed

‘knowledge of social scripts’ i.e. expected forms of response and usual ways of behaving with others and in social groups. For deaf children this amounts to the cultural learning of patterns of interaction and behaviours when people use sign language; for example, how to get attention, how to break into a group, how to express emotion through the body in a culturally meaningful way, how to arrange lines of sight to ensure inclusion, the cultural aspects of empathic responses. Graham and Tobin (2019) describe this as the *deaf bodily habitus* which means that elements such as maintaining eye contact, being aware of visual space as the canvas for language, and cultural rules and norms of conversation can be acquired. They cite examples such as acquiring the very early markers of visual listening that demonstrate engagement and social attention amongst child sign language users. In other words, the development of deaf cultural identity is strongly linked also to sign language use in social interaction with others. This also is an element of social-emotional development.

For deaf children in hearing families some of these crucial indicators of social-emotional development in sign language media only start to be acquired in signing environments of preschools, rather than at home, and are consequently delayed (Graham and Tobin, 2019). In short, cultural norms of interaction are part of social-emotional development too and require access to signing environments for deaf children. This includes “opportunities to learn effective social communication skills from peer or adult models” (Bobzien et al., 2013, p. 340).

One study by Fengler, Delfau and Roder (2018) compared the emotion perception of early and late signers who had cochlear implants to investigate whether age of access to a sign language made a difference. They concluded that deaf early signers who are cochlear implant (CI) users have better accuracy of emotion recognition, in particular for multisensory contexts where both visual and auditory information are involved. Early signers showed better accuracy in recognising emotional vocal expressions when these were paired with congruent facial expressions, compared to those who acquired sign language later and to hearing controls. Early signers did not outperform others in recognising facial expressions alone; their advantage appeared when they had to

integrate facial and vocal cues demonstrating advantage in cross-modal emotional perception.

In a longitudinal study of preschool aged deaf children, it was found that early access to sign language predicted better and stronger social adaptability (e.g. the ability to resist behaviours such as acting impulsively, pushing and shoving when angry, or not sharing toys) (Allen et al., 2014).

LITERACY

Some background issues that apply to all children

All children require good literacy to thrive in childhood and into adult life. It is a foundation for educational attainment and subsequent employment. Strong reading comprehension skills are vital for academic success, as it enables understanding of academic texts, instructions and exam questions. It also enables the growth of knowledge. Literacy is also needed to navigate everyday life. Reading for pleasure contributes to good mental health. Those with poor literacy experience significant social as well as intellectual disadvantages (Triggs, 2024).

The foundations of literacy begin in very early childhood with routines of joint attention, sharing books with care givers and even the physical habits of looking at and turning pages acting as building blocks. Emergent literacy skills refer to the skills and knowledge that young children have prior to learning to read and write. This concept encompasses the early stages of literacy development, typically from birth to around age five, before formal education begins. Emergent literacy skills in hearing children include early language skills (listening, speaking and understanding spoken language), print awareness (recognition of letters and frequent words), speech-based phonological awareness (the ability to recognise and manipulate sounds in spoken language, e.g., rhymes, syllables, and phonemes), and narrative skills (the ability to understand and tell stories). These skills are predictors of successful literacy attainment in hearing children (Gibson et al., 2021). For deaf children pathways to successful literacy development is often different, particularly if they have limited access to spoken language.

Challenges for deaf children

Reading proficiency remains an enduring challenge for many deaf children. For monolingual deaf children using spoken language, poor proficiency in English is linked to decreased auditory language input (Bochner and Bochner, 2009; Luckner and Cooke, 2010; Paul, 2000). This affects the rate and size of vocabulary development. Natural connections between sounds of words, their referent in everyday life (objects, emotions, actions) and the written form of words and expressions are disrupted. For deaf children growing up with a sign language as a first language, the situation is

different because reading comprehension equates to proficiency in a second language (not their first language in a different modality). That is to say they are not reading the same language they are ‘speaking’ as is the case with hearing children who might speak English and then learn to read English.

Numerous studies have shown the link between good sign language skills and good reading comprehension (Chamberlain and Mayberry, 2000; Hermans, Ormel and Knoors, 2010; Strong and Prinz, 1997). However, not all of these include a clear link between early exposure to sign language and literacy, focusing instead on correlations with sign language proficiency. Whilst early exposure to sign language is related to sign language development (see early language development section) separating out early exposure from sign language proficiency is not straightforward.

For hearing children, strong spoken language skills are a predictor of developing strong reading comprehension skills, i.e., children who are skilled at understanding and expressing spoken language are more likely to have better reading comprehension skills compared to those with weak oral language abilities (Lervag, Hulme and Melby-Lervag, 2018). Most studies on deaf children have focused on spoken language skills and how this relates to reading comprehension, which is problematic as most deaf children do not have full access to spoken language even with the assistance of hearing technologies. Consequently, reading deficits are often blamed on poor speech-based phonological awareness as deaf children cannot fully access the sounds of spoken language and this is seen to be a reason for the prevalence of poor literacy in the deaf population.

However, an increasing number of studies have started to explore the effects of early sign language acquisition and sign language proficiency on a range of components of literacy, including emergent literacy, reading comprehension, and the relationship between sign based phonological awareness and reading skills.

For all deaf children, strong reading comprehension skills are arguably more essential, as it provides them with an accessible route to information that cannot be obtained through spoken language.

Benefits of early access to a sign language

There is no evidence that early access to sign language impedes deaf children's progress in reading and writing (Dostal et al., 2024). For many people this will come as a surprise because it is often assumed that learning to read depends on hearing and recognising sounds that are then connected to the words on the page (phonological awareness). Instead, there is growing evidence shows that sign language functions as a linguistic basis for the development of reading in the case of deaf children who use sign language as their dominant language (Novogrodsky et al., 2014).

Several studies have shown a clear relationship between sign language skills and literacy skills with the level of skills being a more important factor than whether deaf children are exposed to native or non-native models of signing. For example, in a study exploring emergent literacy skills in deaf children between the ages of 3 and 6 raised in signing homes (with both deaf and hearing parented families), initially having deaf parents seemed to significantly impact emergent literacy (Allen and Morere, 2020). However, when American Sign Language (ASL) skill was considered, the effect of having deaf parents was no longer significant. The authors concluded that stronger ASL skills significantly contributed to literacy levels and growth, regardless of parental hearing status.

A study on emergent literacy in 237 deaf children aged 3 to 5 (Allen, 2015), (n=237) investigated the effects of age, fingerspelling ability, and receptive ASL skills on the ability to write, say, or sign letters of the English alphabet. All three variables had significant independent effects on letter-writing ability. ASL skills also had indirect effects through fingerspelling, highlighting the importance of combining signing and fingerspelling for supporting early literacy. Strong associations between ASL skill and letter writing were observed in signing deaf and hearing families, but not in non-signing

hearing families. The study concludes that early exposure to a visual language is crucial for developing emergent literacy skills, and that deaf children in non-signing homes may face a higher risk of delayed reading development.

Knowledge of sign language vocabulary has been found to correlate with knowledge of print vocabulary of spoken language from an early age (Hermans et al., 2008; Hermans et al., 2010; Strong and Prinz, 1997).

Children who have had early exposure to quality sign language are more skilled at reading English as a second language in adulthood than those exposed to sign language later in childhood (Pierce et al., 2017). In a self-paced reading assessment, deaf adult native signers read sentences faster and showed better comprehension of the sentences compared to nonnative signers (Traxler et al., 2013).

One study looked at antonym knowledge in ASL (being able to correctly recognise opposite signs) and its relationship to reading comprehension in English (Novogrodsky et al., 2014). It compared deaf children with deaf parents and those with hearing parents. Deaf children growing up with deaf parents showed more age-related developmentally typical antonym development than those with hearing parents. However, further analyses showed that ASL antonym knowledge accounted for reading comprehension differences over and above the hearing status of parents, making the deaf-parent advantage nonsignificant.

Hrastinski and Wilbur (2016) explored the influence of ASL proficiency on reading comprehension skills and overall academic performance in a group of 85 deaf children from 6th to 11th grade, in an ASL/English bilingual educational setting. The majority of students highly fluent in ASL were exposed to it early in life with the average age being under 1 year old. The results showed that highly proficient ASL users outperformed their less proficient peers in reading comprehension, language use, and mathematics. ASL proficiency was the single predictor of academic achievement, including reading comprehension, while other variables such as home language, age at enrolment, and

presence of cochlear implants did not significantly contribute after controlling for ASL proficiency.

The relationship between knowledge of ASL syntax (sentence construction) and how it might support reading print English was investigated (Hoffmeister et al., 2022) for deaf was investigated in a study of 178 native signers and 339 non-native signers between the ages of 7.6 and 18.5 years. Those with earlier exposure to ASL had better language fluency in ASL and better reading. This was more prevalent in deaf children with deaf parents (DOD) but also true for deaf children of hearing parents (DOH) if exposed to ASL early. Analyses revealed that native signers outperformed non-native signers on ASL vocabulary tasks and English reading comprehension and syntax. Age of exposure to sign language and knowledge of ASL predicted reading comprehension at lower ability levels, with knowledge of ASL being significant predictors at all levels. ASL syntax was also a robust predictor of English syntax at all ability levels, with ASL vocabulary facilitating English syntax understanding at lower and middle ability levels.

Most studies focus on speech-based phonological awareness in deaf children and how this supports reading development in print. However, some studies explore the relationship between sign-based phonological awareness and reading skills in print (e.g. Keck and Wolgemuth, 2020). In this study, deaf children with deaf parents (DOD, ASL early learners) were compared with deaf children with hearing parents (DOH, ASL late learners). Children were tested on ASL phonological awareness, reading ability, academic progress and nonverbal intelligence. The DOD group showed positive correlations between ASL phonological awareness, reading ability and academic progress. There were no such correlations for the DOH group. The authors concluded that early ASL exposure supports stronger English literacy skills, and that cross-modal language transfer (from sign to spoken/written language) is possible, similar to transfer between two spoken languages.

Corina et al. (2014) explored the impact of sign language experience on sign based phonological awareness in ASL (ASL PA). They compared early vs late signers whilst

controlling for the number of years of experience to ASL. Deaf signers exposed to ASL from infancy performed better on PA tasks for ASL compared to those exposed later in life. This relationship remained significant even after controlling for the number of years of experience with sign language. For a subset of participants, there was a positive correlation between PA for ASL and PA for English, particularly in native signers. This suggests that early exposure to ASL can enhance metalinguistic skills that are transferable to other languages.

Fingerspelling, while familiar to most signers, serves a unique function in language and literacy development. Beyond representing written words, it can reinforce phonological awareness and support vocabulary growth, especially in educational contexts. For deaf children, regular exposure to fingerspelling - whether in school or at home - has been linked to stronger reading and writing skills. Its role as a bridge between sign and print makes it especially valuable in bilingual (sign-spoken/written) language development (Haptonstall-Nykaza and Schick, 2007; Hile, 2009). Haptonstall-Nykaza and Schick's (2007) study explored how fingerspelling in ASL can facilitated the decoding (of meaning) of English words, in particular, new English vocabulary. Deaf children attending an ASL immersion school were exposed to a training programme consisting of fingerspelling with the ASL sign and fingerspelling with the written English word. Deaf children of deaf parents (exposed to early sign language) performed better than those with hearing parents, but deaf children of hearing parents showed significant improvement. This study concludes that fingerspelling can facilitate English word learning in deaf children, as it provides a bridge between ASL and English print.

Hile's (2009) study explored the relationship between children's ability to learn fingerspelled words and their reading and vocabulary skills. The study found that deaf children from deaf families learned more words than deaf children of hearing families regardless of age. There was a strong relationship between the ability to learn new words through fingerspelling and the child's reading and vocabulary skills, and moderate relationships with the child's length of time in an ASL program and the child's age when the parents began learning sign language. A strong relationship was found

between learning fingerspelled words and reading skills and length of time at school(s) that use ASL.

HEALTH AND WELLBEING

Some background issues that apply to all children

Optimum Early Childhood Development (ECD) for all children is the cornerstone of later health and wellbeing. This is because meeting the milestones of ECD is closely linked to children achieving their potential and preventing unnecessary harms with later consequences for health, social thriving and wellbeing. UN Sustainable Development Goal 4.2 states the responsibility of countries to “ensure that all girls and boys have access to quality early childhood development...” Article 24 of the United Nations Convention on the Rights of the Child states that “Every child has the right to the best possible health” (UNCRC, 1989). Promoting the healthy growth and development of children, especially in the first 5 years of life is a WHO (World Health Organisation) international priority.

Health is a product of social, economic and environmental conditions (Marmot, et al., 2010), not just a product of bodily function or absence of illness. The social determinants of health include income, education, housing, employment and access to healthcare. For example, educational attainment is strongly linked to health behaviours and outcomes with Public Health England (2017) reporting that “more educated individuals are less likely to suffer from long-term diseases and to report themselves in poor health or suffer from mental disorders such as depression or anxiety”. The influence of socio-economic factors and other social determinants begins in early childhood for all children.

Challenges for deaf children

Some of the key social determinants of poor health are disproportionately distributed in deaf populations as secondary consequences of being deaf (Strong and Prinz, 1997) including poor educational outcomes (Hutchinson, 2023), under- and un-employment (Garberoglio et al., 2019), poverty (Kim et al., 2018), stigma (Kushalnagar et al., 2011) and isolation (Charlson et al., 1992; Steinberg, 2000). Deaf children and young people experience poor mental health in later childhood and into adulthood in comparison with their hearing peers particularly with respect to anxiety and depression (Roberts et al., 2015; Young et al., 2023). Rates of serious trauma, including child abuse and

neglect, domestic violence and victimisation are around twice as high among deaf populations in comparison with hearing people (see Anderson et al., 2016 for review). Furthermore, although some deaf people's traumatic developmental experiences in childhood are similar to those in the general population (e.g. emotional abuse), many are reported as unique to Deaf individuals such as experiencing lack of communication with key caregivers or being punished for using sign language (Anderson et al., 2016). This is known as adverse childhood communication experiences (ACCES) which can be described as a form of toxic stress experienced by deaf children (Kushalnagar et al. (2020). Trauma is compounded by inaccessible health, welfare and protection services for deaf signers, including children.

Good health literacy assists in the prevention of avoidable ill health, can reduce the adverse consequences of health conditions and support individuals in tackling health challenges. Health literacy begins in childhood. WHO (2021) defines health literacy as “representing the personal knowledge and competencies that accumulate through daily activities, social interactions and across generations. Personal knowledge and competencies are mediated by the organisational structures and availability of resources that enable people to access, understand, appraise, and use information and services in ways that promote and maintain good health and well-being for themselves and those around them.” Findings of a comprehensive systematic review on the health literacy of deaf people found that, in comparison with hearing/general population, deaf people have poorer health literacy, and greater difficulties in accessing and seeking health information (Piao et al., 2023).

Another issue is the barriers within the healthcare system that Deaf people face (Rogers et al., 2025) with regard to access, appropriate diagnosis and timely treatment. Such barriers can begin in childhood with deaf children not getting timely access to support they need with regards to their mental health difficulties as reported by NHS Deaf Mental Health Working Group (2023). For example, many self-help resources are not accessible for deaf children, nor are school-based resilience programmes in many settings in the UK.

Learning about keeping well, illness consequences, what to do when problems occur are all forms of contextualised learning acquired from early childhood and picked up through the family. Barriers with family communication in childhood, whether direct or indirect (e.g. spontaneous conversations at family meals), therefore can lead to negative health and wellbeing outcomes in adulthood when opportunities for such contextualised learning are reduced. Hall et al. (2018) reported that those deaf adults who recalled inaccessibility to family indirect communication (also known as dinner table syndrome) were likely to be those with hearing parents and were at higher risk for poorer health outcomes. Kushalnagar et al., 2020, in a large survey based national study, demonstrated that what was termed, communication neglect, in early life with family members, increases the risks of having depression/anxiety, cardiovascular disease, diabetes, hypertension, and lung disease (Kushalnagar et al., 2020). This highlights the vital importance of quality communication access, both with key caregiver as well as the wider family, for an individual's health outcomes right from the earliest years of development.

Benefits of early access to sign language for health and wellbeing

The extent to which early access to sign language plays a preventative or protective role in avoiding later adverse health and mental health outcomes has hardly been addressed in the literature. Instead, there is clear evidence of the role of impoverished communication and language deprivation in poorer health outcomes in adulthood. How this circumstance might be redressed by early access to a sign language is a reasonable conclusion to draw but the current evidence on later health and wellbeing is not founded on the availability or not specifically of access to early sign language.

For example, poor access to direct child-caregiver communication, communication neglect, and language deprivation have been found to be associated with increased risk of having cardiovascular disease, diabetes, and hypertension amongst deaf adults (Kushalnagar et al., 2020). Poor access to indirect family communication and lack of family inclusion in childhood has been found to lead to increased risks of having

depression/anxiety and lung disease amongst deaf adults (Kushalnagar et al., 2020). However early access to sign language is not separately distinguished from the variable of quality of communication and interaction in this study. Distinguishing the effects of communication quality from communication modality in the early years continues to be an important factor in understanding the relationship between early sign language and health and wellbeing. For example, a study by Dammeyer (2010) of psychosocial difficulties amongst deaf children found the severity of these were not related to the hearing status of parents but rather the quality of communication between parents and children. Those deaf children with low levels of either sign language or oral language abilities experienced greater psychosocial difficulties (Dammeyer, 2010).

One aspect of quality of early communication is not just modality but also consistency and matching between child's language and parents' language. Wallis et al., (2004) examined mental health functioning amongst deaf adolescents to see if it is related to early and consistent mode matching between mother and child. They identified three groups: auditory/oral where mother and child both used spoken language; sign match where both used sign language; and sign mismatch where parent and child did not use the same modality. They found no significant differences between the oral matched and sign matched groups, but sign mismatched groups has worse mental health functioning than either of the matched groups or the groups combined.

Many studies of health and wellbeing in deaf children include the variable of sign fluency in the here and now and seek to associate that with current health and wellbeing outcomes. However, this is often not clearly distinguished from early access to a sign language. For example, in a study of adverse childhood experiences (ACEs), not attending at least one school with sign language was significantly associated with multiple adverse childhood experiences. However, signing before the age of five was not found to be a significant variable in ACEs, whether as a risk or protective factor (Hall et al., 2023).

Although there is ample evidence that deaf people disproportionately experience some of the key social determinants of health inequalities the direct link between these and lack of exposure to early sign language is not evidenced. Rather, there is increasing evidence that language deprivation and access to poor-quality communication in early childhood and within the family/home environment is associated with some specific poorer health and mental health outcomes in adulthood. This is not the same as evidencing that lack of access to early sign language causes those adverse outcomes. That conclusion might be inferred but is not demonstrated.

There is a lack of studies that have looked closely at the preventative or protective effects of early sign language access on later adverse health outcomes. In other words, there is insufficient evidence for the benefit of early access to sign language in terms of later health/mental health outcomes. Quality of communication between parents and children remains strongly associated with good mental health and wellbeing but separating out quality communication from specifically signed communication is not adequately demonstrated.

There is a strong argument for classifying inadequate access to language in early childhood as an adverse childhood event in and of itself which in turn has serious consequences for later deaf health and wellbeing.

**PART THREE: SUMMARY
CONCLUSIONS ABOUT THE
BENEFITS OF EARLY
ACCESS TO A SIGN
LANGUAGE**

The following draws together key summary conclusions from each of the topics reviewed in the previous sections. Although it could be read as a standalone document, it is recommended that the relevant sections from which points are drawn are consulted to ensure a nuanced understanding of the points below. The summary focusses specifically on the ‘benefits’ of early access to sign language rather than more general development considerations that are discussed in the sections earlier. Evidence of benefit might include disproving alleged evidence of harm. In some cases, evidence of benefit is weak or unequivocal. This is important too. Just because there is an absence of evidence does not mean early access to sign language is not beneficial.

Deaf child language development

- Over 40 years of research has demonstrated that sign languages are acquired and used in the same way as spoken languages (Humphries et al., 2012).
- Studies of deaf children with deaf parents, who grow up with sign language from birth, consistently show a pattern and rate of sign language acquisition that follows a parallel trajectory to that of typically developing hearing children acquiring a spoken language (Anderson and Reilly, 2002; Chamberlain, Morford and Mayberry, 2000; Meier, 1991; Morgan, 2015; Newport and Meier, 1985; Petitto, 2000; Schick, Marschark and Spencer, 2005).
- There is no evidence to support the assumption that the human brain is hardwired (biologically or neurologically) for the acquisition of spoken language. It is just ready for language, of whatever modality (Humphries et al., 2012; Petitto, 2000).
- Typical language acquisition does not require the presence of speech and sound. It simply requires the presence of good quality and sufficient language in the developmental environment (Pierce et al., 2017)

- There is nothing about visual, spatial, gestural signed languages that of themselves cause delays or deficits in language development provided a child has sufficient exposure to a sign language at the right age (Lu, Jones and Morgan, 2016).
- There is no good evidence that sign language acquisition will create detrimental/poor spoken language outcomes for deaf children (Fitzpatrick et al., 2016).
- The vast majority of deaf children will experience delayed, sub-optimal or deficient language input in the early years of life to a greater or lesser degree, regardless of whether spoken or signed language is available to them (Pierce et al., 2017).
- ‘Late’ acquisition of a sign language has negative impacts on aspects of sign language grammar, including fluency, language processing and comprehension with late signers generally making more errors and being less accurate in both the production and comprehension of sign language (Krebs 2021 p.398-399; Corina et al., 2020; Mayberry, 1993).
- For late deaf signers, the length of time they have been signing is not related to their sign language proficiency. A late signer who has been signing for 30 years is not necessarily more or less proficient than a late signer who has been signing for 10 years. There is not a direct correlation (Corina et al., 2020; Mayberry and Eichen, 1991; Newport, 1990).
- Early exposure to a sign language should be seen as a protective factor against the effects of linguistic deprivation consequent on delayed onset of any language exposure (Declenserie et al., 2023).

- Deaf people who are exposed to sign language at an earlier age, in comparison to those exposed at a later age, do better on tests of sign language processing and sign language knowledge (Petitto, 2000). Many studies show that individuals who are exposed early to sign language in comparison with those who are exposed later, will do better in the acquisition of first and second languages whether those are signed or spoken languages (Mayberry, 2000). However, the quality of the sign language to which they are exposed is a moderating factor.
- Parental sign language *proficiency* is a significant predictor of children's sign language vocabulary size; not the hearing status of parents (Berger et al., 2024).
- There is a clear benefit for deaf children of having access to a sign language prior to implantation, regardless of whether parents are deaf or hearing (native or non-native signers) (Berger et al., 2024; Davidson et al., 2014; Delcenserie et al., 2024; Goodwin and Lillo-Martin, 2019; Hassanzadeh, 2012; Pontecorvo et al., 2023).

Cognitive Development

- Early access to sign language can provide significant cognitive and neurological advantages (Botting et al., 2017; Courtin, 2000; Delcenserie et al., 2024; Mercure et al., 2020).
- Deaf native signing children who are exposed to quality early sign language perform similarly to or in some cases out-perform their hearing peers on tasks evaluating Executive Function (Kotowicz et al., 2023), Working Memory (Goodwin et al., 2022; Hall et al., 2017, 2018) Non-verbal Working Memory (Marshall et al., 2015), and Theory of Mind (Courtin, 2000).
- Sign language knowledge and skills have been found to predict Executive Function skills in deaf children (Kotowicz et al., 2023).

- Research consistently demonstrates that deaf children with deaf parents outperform deaf children with non-signing hearing parents on cognitive assessments. For example, in a study of deaf children with cochlear implants, deaf children growing up with native signers did much better in tests of reasoning, knowledge, visual special processing and working memory (Amraei et al., 2017).
- The cognitive developmental advantages for deaf children of non-native (hearing) signing parents are less than for native signers but how much of this difference is accounted for by delays in language acquisition and language deficits is not clear (Marshall et al., 2015).
- Although early exposure to native signing is found to have a strong impact on the development of Theory of Mind, evidence suggest that even late exposure to a sign language (including a non-native signing model) can lead to faster catch-up in Theory of Mind development than exposure to a solely oral language (Courtin, 2000).
- A small number of studies are demonstrating how properties specific to a sign language such as the use of perspective, movement and iconicity can advance and benefit the development of key cognitive skills (Courtin 2000; Johnson, 2021; Magid and Pyers, 2017).

Social emotional development

- Although deaf children with deaf parents are reported to show better self-concept development, it is difficult to separate out whether this is because of early access to sign language or because of less delay in age-appropriate language development. Stronger language development has been consistently linked to better social-emotional outcomes in children, and vice versa,

regardless of whether they acquire spoken or sign language (Yoshinaga-Itano, 2003).

- For signing deaf children, social-emotional development is also closely linked to cultural development and ways of being deaf in the world because of visual, spatial patterns of interaction that also need to be learned. Those deaf children exposed to culturally deaf interactional spaces at an early age learn this deaf bodily habitus that supports their social emotional development, but most deaf children in hearing families do not (Graham and Tobin, 2019).
- Early signers who go on to have cochlear implants have better emotion perception than late signers with cochlear implants (Fengler, Delfau and Roder, 2018).
- In a longitudinal study of preschool aged deaf children, it was found that early access to sign language predicted better and stronger social adaptability (e.g. the ability to resist behaviours such as acting impulsively, pushing and shoving when angry, or not sharing toys) (Allen et al., 2014).

Literacy

- There is no evidence that early access to sign language impedes deaf children's progress in reading and writing (Dostal et al., 2024).
- Sign language functions as a linguistic basis for the development of reading (in another language) in the case of deaf children who use sign language as their dominant language (Novogrodsky et al., 2014).
- Several studies have shown a clear relationship between sign language skills and literacy skills with the level of skills being a more important factor than whether

deaf children are exposed to native or non-native models of signing (Allen, 2015; Allen and Morere, 2020).

- Knowledge of sign language vocabulary has been found to correlate with knowledge of print vocabulary of spoken language from an early age (Hermans, Knoors, Ormel and Verhoeven, 2008; Hermans et al., 2010; Strong and Prinz, 1997).
- Children who have had early exposure to quality sign language are more skilled at reading English as a second language in adulthood than those exposed to sign language later in childhood demonstrating both better reading proficiency and comprehension (Hrastinski and Wilbur, 2016; Novogrodsky et al., 2014; Pierce et al., 2017; Traxler et al., 2013).
- The beneficial effects on reading proficiency and reading comprehension of early exposure to sign language is found in both children of native and non-native signers (Corina et al., 2014; Haptonstall-Nykaza and Schick, 2007; Hile 2009).
- Hoffmeister et al., 2022 found that age of exposure to sign language and knowledge of ASL predicted reading comprehension at lower ability levels, with knowledge of ASL being significant predictors at all levels.
- In a study of the contribution of fingerspelling to the decoding of English words, and new vocabulary, Haptonstall-Nykaza and Schick (2007) showed that those with early exposure to sign language performed better but deaf children of hearing parents who were using sign language showed significant improvement. This shows that fingerspelling can facilitate English word learning in deaf children, as it provides a bridge between ASL and English print.

Health and Wellbeing

- The extent to which early access to a sign language plays a preventative or protective role in avoiding later adverse health and mental health outcomes has hardly been addressed in the literature. Instead, there is clear evidence of the role of impoverished communication and language deprivation in poorer health outcomes in adulthood (Hall et al., 2018; Kushalnagar et al., 2020). How this circumstance might be redressed by early access to a sign language is a reasonable conclusion to draw but the current evidence on later health and wellbeing is not founded on the availability or not specifically of access to early sign language.
- Poor access to indirect family communication and lack of family inclusion in childhood (adverse childhood communication experiences) has been found to lead to increased risks of having depression/anxiety and lung disease amongst deaf adults (Kushalnagar et al., 2020). However early access to sign language is not separately distinguished from the variable of quality of communication and interaction in this study.
- The severity of psychosocial difficulties amongst deaf children were not related to the hearing status of parents but rather the quality of communication between parents and children. Those deaf children with low levels of either sign language or low levels of oral language abilities experienced greater psychosocial difficulties (Dammeyer, 2010).
- Many studies of health and wellbeing in deaf children include the variable of sign fluency in the here and now and seek to associate that with current health and wellbeing outcomes. However, this is often not clearly distinguished from early access to a sign language. For example, in a study of Adverse Childhood Experiences (ACEs), not attending at least one school with sign language was significantly associated with multiple adverse childhood experiences. However, signing before the age of five was not found to be a significant variable in ACEs (Hall et al., 2023).

- There is an argument that lack of access to the appropriate language a deaf child requires for optimum development in the early years should in and of itself be classified as an Adverse Childhood Experience (of language deprivation) the consequences of which are severely detrimental to later health and wellbeing.

Other observations

- Some topics have investigated much more precisely the benefits of early access to sign language than others; notably studies of literacy, language development and cognitive development. In the case of social-emotional development and health and wellbeing, there is far less precision in the literature about the effects of early exposure to sign language rather than the effects of early language deprivation.
- There is a lack of consistency of reporting concerning sample groups in studies across all topics. This means that clearly differentiating participants with early exposure to sign language from those who did not can be difficult. This reduces the weight of conclusions that might be drawn about the benefits of early access to sign language.
- Although in the past, studies tended to compare deaf children of hearing parents with those of deaf parents, there is growing awareness of the importance instead of focussing on access to sign language (whether native or non-native) rather than just hearing status of parents.
- Exposure to quality sign language is significant, not just early exposure to sign language. Deaf children of deaf parents may experience early language deficits too. Deaf children of hearing parents may enjoy rich quality language models in the early years.

- There is growing evidence that early exposure to some sign language is better than no exposure to sign language even amongst those children who go on to be predominantly oral cochlear implant users.
- The greatest problem by far for all deaf children is the risk of language deprivation. If early access to a sign language can prevent the worst effects of language deprivation during a critical period of development there is a strong argument for its preventative and protective effects, regardless of notions of language choice or language preference.
- There is no evidence of any developmental harm in any area of child development that occurs because a deaf child is exposed early to a sign language.

SECTION FOUR: REFERENCES

Allen, T. E., Letteri, A., Choi, S. H., and Dang, D. (2014). 'Early visual language exposure and emergent literacy in preschool deaf children: findings from a national longitudinal study', *American Annals of the Deaf*, 159(4), pp. 346–358.

<https://doi.org/10.1353/aad.2014.0030>

Allen, T. E. (2015). 'ASL skills, fingerspelling ability, home communication context and early alphabetic knowledge of preschool-aged deaf children', *Sign Language Studies*, 15(3), pp. 233–265. <https://dx.doi.org/10.1353/sls.2015.0006>

Allen, T.E. and Morere, D.A. (2020). 'Early visual language skills affect the trajectory of literacy gains over a three-year period of time for preschool aged deaf children who experience signing in the home', *PloS One*, 15(2), p. e0229591.

<https://doi.org/10.1371/journal.pone.0229591>

Amraei, K., Amirsalari, S., and Ajalloueyan, M. (2017). 'Comparison of intelligence quotients of first- and second generation deaf children with cochlear implants', *International Journal of Pediatric Otorhinolaryngology*, 92, pp. 167–170.

<https://doi.org/10.1016/j.ijporl.2016.10.005>

Anderson, D. and Reilly, J. (2002). 'The MacArthur Communicative Development Inventory: Normative data for American Sign Language', *The Journal of Deaf Studies and Deaf Education*, 7(2), pp. 83–106. <http://dx.doi.org/10.1093/deafed/7.2.83>

Anderson, M. L., Wolf Craig, K. S., Hall, W. C., and Ziedonis, D. M. (2016). 'A Pilot Study of Deaf Trauma Survivors' Experiences: Early Traumas Unique to Being Deaf in a Hearing World', *Journal of Child & Adolescent Trauma*, 9(4), pp. 353–358.

<https://doi.org/10.1007/s40653-016-0111-2>

Anderson, N.J., Graham, S.A., Prime, H., Jenkins, J.M., and Madigan, S. (2021). 'Linking Quality and Quantity of Parental Linguistic Input to Child Language Skills: A Meta-Analysis', *Child Development*, 92(2), pp. 484–501. <https://doi.org/10.1111/cdev.13508>

Berger, L., Pyers, J., Lieberman, A., and Caselli, N. (2024). 'Parent American sign language skills correlate with child-but not toddler-ASL vocabulary', *Language Acquisition*, 31(2), pp. 85 – 99. <https://dx.doi.org/10.1080/10489223.2023.2178312>

Bobzien, J., Richels, C., Raver, S. A., Hester, P., Browning, E., and Morin, L. (2013). 'An observational study of social communication skills in eight preschoolers with and without hearing loss during cooperative play', *Early Childhood Education Journal*, 41(5), pp. 339– 346. <https://doi.org/10.1007/s10643-012-0561-6>

Bochner, J. H., and Bochner, A. M. (2009). 'A limitation on reading as a source of linguistic input: Evidence from deaf learners', *Reading in a Foreign Language*, 21(2), pp. 143–158. <https://doi.org/10.125/66827>

Botting, N., Jones, A., Marshall, C., Denmark, T., Atkinson, J., and Morgan, G. (2017). 'Nonverbal Executive Function is Mediated by Language: A Study of Deaf and Hearing

Children', *Child Development*, 88(5), pp. 1689–1700.

<https://doi.org/10.1111/cdev.12659>

Caselli, N., Pyers, J., and Lieberman, A.M. (2021). 'Deaf Children of Hearing Parents Have Age-Level Vocabulary Growth When Exposed to American Sign Language by 6 Months of Age', *Journal of Pediatrics*. 232, pp. 229-236.

<https://doi.org/10.1016/j.jpeds.2021.01.029>

Chamberlain, C., Morford, J.P., and Mayberry, R.I. (2000). *Language Acquisition by Eye: Early Language Acquisition*. Mahwah, NJ: Erlbaum.

Chamberlain, C. and Mayberry, R.I. (2000). 'Theorizing about the relation between American Sign Language and Reading', in Chamberlain, C., Morford, J.P. and Mayberry, R.I (eds.) *Language Acquisition by Eye: Early Language Acquisition*. Mahwah, NJ: Erlbaum, pp. 221-259.

Charlson, E., Strong, M., and Gold, R. (1992). 'How successful deaf teenagers experience and cope with isolation', *American Annals of the Deaf*, 137(3), pp. 261-270.

<https://doi.org/10.1353/aad.2012.0447>

Corina, D.P., Hafer, S., and Welch, K. (2014). 'Phonological awareness for American Sign Language', *The Journal of Deaf Studies and Deaf Education*, 19(4), pp. 530-545.

<https://doi.org/10.1093/deafed/enu023>

Corina, D.P., Farnady, L., LaMarr, T., Pedersen, S., Lawyer, L., Winsler, K., Hickok, G., and Bellugi, U. (2020). 'Effects of age on American Sign Language sentence repetition', *Psychology and Aging*, 35(4), pp. 529-535. <https://dx.doi.org/10.1037/pag0000461>

Courtin, C. (2000). 'The impact of sign language on the cognitive development of deaf children: The case of theories of mind', *The Journal of Deaf Studies and Deaf Education*, 5(3), pp. 266-276. <https://doi.org/10.1093/deafed/5.3.266>

Dammeyer, J. (2010). 'Psychosocial development in a Danish population of children with cochlear implants and deaf and hard-of-hearing children', *The Journal of Deaf Studies and Deaf Education*, 15(1), pp. 50-58. <https://doi.org/10.1093/deafed/enp024>

Davidson, K., Lillo-Martin, D., and Pichler, D.C. (2014). 'Spoken English language development among native signing children with cochlear implants', *The Journal of Deaf Studies and Deaf Education*, 19(2), pp. 238-250. <https://doi.org/10.1093/deafed/ent045>

Delcenserie, A., Genesee, F., and Champoux, F. (2024). 'Exposure to sign language prior and after cochlear implantation increases language and cognitive skills in deaf children', *Developmental Science*, 27(4), p. e13481. <https://doi.org/10.1111/desc.13481>

DfES (2006). *Monitoring protocol for deaf babies and children*, 2nd edition. Available from: <https://torbayfamilyhub.org.uk/wp-content/uploads/2023/08/merged-the-monitoring-protocol-for-deaf-babies-and-children.pdf>

DfES (2006). *Monitoring protocol for deaf babies and children: Level 2 materials*. Available from: <https://torbayfamilyhub.org.uk/wp-content/uploads/2023/08/merged-the-monitoring-protocol-for-deaf-babies-and-children.pdf>

DoE (2024). *Early years foundation stage statutory framework. For group and school-based providers: Setting the standards for learning, development and care for children from birth to five*. Available from: https://assets.publishing.service.gov.uk/media/670fa42a30536cb92748328f/EYFS_statutory_framework_for_group_and_school_-_based_providers.pdf

Dostal, H., Scott, J., Gediell, A., Vilhalva, S., and Gasparin, C. (2024). 'Literacy and signing deaf students: A multi-national scoping review,' *The Journal of Deaf Studies and Deaf Education*, 29(4), pp. 467-484. <https://doi.org/10.1093/jdsade/enae023>

Fengler, I., Delfau, P. C., and Röder, B. (2018). 'Early Sign Language Experience Goes Along with an Increased Cross-modal Gain for Affective Prosodic Recognition in Congenitally Deaf CI Users', *The Journal of Deaf Studies and Deaf Education*, 23(2), pp. 164–172. <https://doi.org/10.1093/deafed/enx051>

Finders, J., Wilson, E., and Duncan, R. (2023). 'Early childhood education language environments: considerations for research and practice', *Frontiers Psychology*, 14. <https://doi.org/10.3389/fpsyg.2023.1202819>

Fitzpatrick, E. M., Hamel, C., Stevens, A., Pratt, M., Moher, D., Doucet, S.P., Neuss, D., Bernstein, A., and Na, E. (2016). 'Sign language and spoken language for children with hearing loss: A systematic review', *Pediatrics*, 137, p. e20151974. <https://doi.org/10.1542/peds.2015-1974>

Garberoglio, C.L., Palmer, J.L., Cawthon, S., and Sales, A. (2019). 'Deaf people and employment in the United States: 2019. *National Deaf Center on Postsecondary Outcomes*. Available from: https://nationaldeafcenter.org/wp-content/uploads/2019/10/Deaf-People-and-Employment-in-the-United-States_-2019-7.26.19ENGLISHWEB.pdf

Gibson, J.L., Newbury, D.F., Durkin, K., Pickles, A., Conti-Ramsden, G., and Toseeb, U. (2021). 'Pathways from the early language and communication environment to literacy outcomes at the end of primary school: The roles of language development and social development', *Oxford Review of Education*, 47 (2), pp. 260-283. <https://doi.org/10.1080/03054985.2020.1824902>

Goodwin, C. and Lillo-Martin, D. (2019). 'Morphological accuracy in the speech of bimodal bilingual children with CIs', *The Journal of Deaf Studies and Deaf Education*, 24(4), pp. 435-447. <https://doi.org/10.1093/deafed/enz019>

Goodwin, C., Carrigan, E., Walker, K., and Coppola, M. (2022). 'Language not auditory experience is related to parent-reported executive functioning in preschool-aged deaf

and hard-of-hearing children', *Child Development*, 93(1), pp. 209-224.

<https://doi.org/10.1111/cdev.13677>

GOV UK (2019). *Health Matters: Hearing loss across the life course*. Available here:

<https://ukhsa.blog.gov.uk/2019/06/05/health-matters-hearing-loss-across-the-life-course/>

GPODHH (undated). *Welcome to GPODHH*. Available at: <https://www.gpodhh.org/>.

Graham, P.J. and Tobin, J.J. (2019). 'The Body as a Canvas: Developing a Deaf Bodily Habitus in Deaf Signing Preschools', in Leigh, I.W. and O'Brien, C.A. (eds.) *Deaf Identities: Exploring New Frontiers*, New York: Oxford University Press,

<http://doi.org/10.1093/oso/9780190887599.003.0007>

Hall, M.L., Eigsti, I., Bortfeld, H. and Lillo-Martin, D. (2017). 'Auditory deprivation does not impair executive function, but language deprivation might: Evidence from a parent-report measure in deaf native signing children', *The Journal of Deaf Studies and Deaf Education*, 22(1), pp. 9-21. <https://doi.org/10.1093/deafed/enw054>

Hall, M.L. (2018). 'Executive function in deaf children: Auditory access and language access', *Journal of Speech, Language and Hearing Research*, 61(8), pp. 1970-1988.

https://doi.org/10.1044/2018_JSLHR-L-17-0281

Hall, M.L., Hall, W.C., and Caselli, N.K. (2019). 'Deaf children need language, not (just) speech', *First Language*, 39(4), pp. 367-395.

<https://doi.org/10.1177/0142723719834102>

Hall, W. C. (2017). 'What you don't know can hurt you: The risk of language deprivation by impairing sign language development in deaf children', *Maternal and Child Health Journal*, 21(5), pp. 961-965. <https://doi.org/10.1007/s10995-017-2287-y>

Hall, W.C., Levin, L.L., and Anderson, M.L. (2017). 'Language deprivation syndrome: A possible neurodevelopmental disorder with sociocultural origins', *Social Psychiatry and Psychiatric Epidemiology*, 52, pp. 761-776. <https://doi.org/10.1007/s00127-017-1351-7>

Hall, W. C., Smith, S. R., Sutter, E. J., DeWindt, L. A., and Dye, T. D. V. (2018).

'Considering parental hearing status as a social determinant of deaf population health: Insights from experiences of the "dinner table syndrome"', *PloS one*, 13(9), p. e0202169.

<https://doi.org/10.1371/journal.pone.0202169>

Hall, W. C., Dye, T. D. V., and Siddiqi, S. (2023). 'Associations of childhood hearing loss and adverse childhood experiences in deaf adults', *PloS one*, 18(6), p. e0287024.

<https://doi.org/10.1371/journal.pone.0287024>

Halle, T.G. and Darling-Churchill, K.E. (2016). 'Review of measures of social and emotional development', *Journal of Applied Developmental Psychology*, 45, pp. 8-18.

doi: <https://doi.org/10.1016/j.appdev.2016.02.003>

Haptonstall-Nykaza, T.S. and Schick, B. (2007). 'The transition from fingerspelling to English print: Facilitating English decoding', *The Journal of Deaf Studies and Deaf Education*, 12(2), pp. 172-183. <https://doi.org/10.1093/deafed/enm003>

Hartshorne, J. K., Tenenbaum, J. B., & Pinker, S. (2018). A critical period for second language acquisition: Evidence from 2/3 million English speakers. *Cognition*, 177, 263–277. <https://doi.org/10.1016/j.cognition.2018.04.007>

Hassanzadeh, S. (2012). 'Outcomes of cochlear implantation in deaf children of deaf parents: Comparative study', *Journal of Laryngology and Otolaryngology*, 126(10), pp. 989–994. <https://doi.org/10.1017/s0022215112001909>

Head Start (undated). *Effective Practice Guides: Social and Emotional Development*. Available at: <https://headstart.gov/school-readiness/effective-practice-guides/social-emotional-development>

Hermans, D., Knoors, H., Ormel, E., and Verhoeven, L. (2008). 'The relationship between the reading and signing skills of deaf children in bilingual education programs', *The Journal of Deaf Studies and Deaf Education*, 13(4), pp. 518-530. <https://doi.org/10.1093/deafed/enn009>

Hermans, D., Ormel, E., and Knoors, H. (2010). 'On the relation between the signing and reading skills of deaf bilinguals', *International Journal of Bilingual Education and Bilingualism*, 13(2), pp. 187-199. <https://doi.org/10.1080/13670050903474093>

Hile, A. (2009). *Deaf children's acquisition of novel fingerspelled words*. (Unpublished doctoral dissertation). University of Colorado, Boulder.

Hoffmeister, R., Henner, J., Caldwell-Harris C., and Novogrodsky R. (2022). 'Deaf Children's ASL Vocabulary and ASL Syntax Knowledge Supports English Knowledge', *The Journal of Deaf Studies and Deaf Education*, 27(1), pp. 37-47. <https://doi.org/10.1093/deafed/enab032>

Hrastinski, I. and Wilbur, R.B. (2016). 'Academic achievement of deaf and hard-of-hearing students in an ASL/English bilingual program', *The Journal of Deaf Studies and Deaf Education*, 21(2), pp. 156-170. <https://doi.org/10.1093/deafed/env072>

Humphries, T., Kushalnagar, P., and Mathur, G. (2012). 'Language acquisition for deaf children: Reducing the harms of zero tolerance to the use of alternative approaches', *Harm Reduction Journal*, 9(16), pp. 1-9. <https://doi.org/10.1186/1477-7517-9-16>

Humphries, T., Kushalnagar, P., Mathur, G., Napoli, D. J., Padden, C., Rathmann, C., and Smith, S. (2016a). 'Avoiding linguistic neglect of deaf children', *Social Service Review*, 90(4), pp. 589–619. <https://doi.org/10.1086/689543>

Humphries, T., Kushalnagar, P., Mathur, G., Napoli, D. J., Padden, C., Rathmann, C., and Smith, S. (2016b). 'Language choices for deaf infants: Advice for parents regarding sign

language', *Clinical Pediatrics*, 55(6), pp. 513–517.

<https://doi.org/10.1177/0009922815616891>

Hutchinson, J. (2023). 'The educational outcomes of deaf children in England: Attainment at key stages 1, 2 and 4', *Educational Policy Institute*. Available from:

<https://epi.org.uk/wp-content/uploads/2023/03/Educational-outcomes-of-deaf-children-in-England.pdf>

Johnson, M. (2021). 'The development benefits of allowing deaf children with cochlear implants early access to sign language', *Infants & Young Children*, 34(2), pp. 141-155.

<https://doi.org/10.1097/IYC.0000000000000185>

Joy A., Ledger S., and Duncan J. (2025). 'Deaf role models for Deaf children in hearing families: a scoping review', *Journal of Deaf Studies and Deaf Education*, 30(1), pp. 17–30

<https://doi.org/10.1093/jdsade/ena028>

Keck, T. and Wolgemuth, K. (2020). 'American Sign Language phonological awareness and English reading abilities: Continuing to explore new relationships', *Sign Language Studies*, 20(2), pp. 334–354. <https://doi.org/10.1353/sls.2020.0004>

Kim, E. J., Byrne, B., and Parish, S. L. (2018). 'Deaf people and economic well-being: findings from the Life Opportunities Survey', *Disability and Society*, 33(3), pp. 374-391.

<https://doi.org/10.1080/09687599.2017.1420631>

Kotowicz, J., Woll, B., and Herman R. (2023). 'Executive function in deaf native signing children', *The Journal of Deaf Studies and Deaf Education*, 28(3), pp. 255-266.

<https://doi.org/10.1093/deafed/enad011>

Kral, A., Kronenberger, W.G., Pisoni, D.B., and O'Donoghue, G.M. (2016).

'Neurocognitive factors in sensory restoration of early deafness: a connectome model', *The Lancet Neurology*, 15(6), pp. 610-621. [https://doi.org/10.1016/S1474-4422\(16\)00034-X](https://doi.org/10.1016/S1474-4422(16)00034-X)

Krebs, J., Roehm, D., Wilbur, R.B., and Malaia, E.A. (2021). 'Age of sign language acquisition has lifelong effect on syntactic preferences in sign language users', *International Journal of Behavioral Development*, 45(5), pp. 397-408.

<https://doi.org/10.1177/0165025420958193>

Kushalnagar, P., Topolski, T. D., Schick, B., Edwards, T. C., Skalicky, A. M., and Patrick, D. L. (2011). 'Mode of communication, perceived level of understanding, and perceived quality of life in youth who are deaf or hard of hearing', *Journal of Deaf Studies and Deaf Education*, 16(4), pp. 512–523. <https://doi.org/10.1093/deafed/enr015>

<https://doi.org/10.1093/deafed/enr015>

Kushalnagar, P., Ryan, C., Paludneviciene, R., Spellun, A., and Gulati, S. (2020). 'Adverse Childhood Communication Experiences Associated With an Increased Risk of Chronic Diseases in Adults Who Are Deaf', *American Journal of Preventive Medicine*, 59(4), pp. 548–554. <https://doi.org/10.1016/j.amepre.2020.04.016>

<https://doi.org/10.1016/j.amepre.2020.04.016>

Lervag, A., Hulme, C., and Melby-Lervag, M. (2018). 'Unpicking the Developmental Relationship Between Oral Language Skills and Reading Comprehension: It's Simple, But Complex', *Child Development*, 89(5), pp. 1821-1838.

<https://doi.org/10.1111/cdev.12861>

Loots, G., Devise, I., and Jacquet, W. (2005). 'The impact of visual communication on the intersubjective development of early parent-child interaction with 18- to 24-month-old deaf toddlers', *The Journal of Deaf Studies and Deaf Education*, 10(4), pp. 357-375.

<https://doi.org/10.1093/deafed/eni036>

Lu, J., Jones, A., and Morgan, G. (2016). 'The impact of input quality on early sign development in native and non-native language learners', *Journal of Child Language*, 43(3), pp. 537-552. <https://doi.org/10.1017/S0305000915000835>

Luckner, L. J., and Cooke, C. (2010). 'A summary of the vocabulary research with students who are deaf or hard of hearing', *American Annals of the Deaf*, 155(1), pp. 38-67. <https://doi.org/10.1353/aad.0.0129>

Magid, R. W., and Pyers, J. E. (2017). "I use it when I see it": The role of development and experience in Deaf and hearing children's understanding of iconic gesture', *Cognition*, 162, pp. 73-86. <https://doi.org/10.1016/j.cognition.2017.01.015>

Malik, F. and Marwaha, R. (Updated 2022). 'Developmental Stages of Social Emotional Development in Children' in *StatPearls*, Treasure Island (FL): StatPearls Publishing.

Available from: <https://www.ncbi.nlm.nih.gov/books/NBK534819/>

Marmot, M., Goldblatt, P., Allen, J., Boyce, T., McNies, D., Grady, G., and Geddes, I. (2010). 'Fair society, healthy lives', *The Marmot Review*. Available from:

<https://www.instituteofhealthequity.org/resources-reports/fair-society-healthy-lives-the-marmot-review/fair-society-healthy-lives-full-report-pdf.pdf>

Marshall, C., Jones, A., Denmark, T., Mason, K., Atkinson, J., Botting, N., and Morgan, G. (2015). 'Deaf children's non-verbal working memory is impacted by their language experience', *Frontiers in Psychology*, 6, pp. 1-12.

<https://doi.org/10.3389/fpsyg.2015.00527>

Matthijs, L., Hardonk, S., Sermijn, J., Van Puyvelde, M., Leigh, G., Van Herreweghe, M., and Loots, G. (2017). 'Mothers of Deaf Children in the 21st Century: Dynamic Positioning Between the medical and Cultural-Linguistic Discourses', *The Journal of Deaf Studies and Deaf Education*, 22(4), pp. 365-377. <https://doi.org/10.1093/deafed/enx021>

Mayberry, R. I. and Eichen, E. B. (1991). 'The long-lasting advantage of learning sign language in childhood: Another look at the critical period for language acquisition', *Journal of Memory and Language*, 30(4), pp. 486-512. [https://doi.org/10.1016/0749-596X\(91\)90018-F](https://doi.org/10.1016/0749-596X(91)90018-F)

Mayberry, R. I. (1993). 'First-language acquisition after childhood differs from second-language acquisition: The case of American Sign Language', *Journal of Speech and Hearing Research*, 36(6), pp. 51–68. <https://doi.org/10.1044/jshr.3606.1258>

Mayberry, R., Kluender, R. (2018). 'Rethinking the critical period for language: New insights into an old question from American Sign Language'. *Bilingualism: Language and Cognition*, 21(5), pp.886-905. <https://doi.org/10.1017/S1366728917000724>

Meier, R. P. (1991). 'Language acquisition by deaf children', *American Scientist*, 79(1), 60–70. Available from: <https://www.jstor.org/stable/29774278>

Mercure, E. and Mousley, V. (2024). 'Brain development in deaf children or children of deaf parents', in Kadosh, K.C. (Ed.), *The Oxford Handbook of Developmental Cognitive Neuroscience* (pp. 1111-1128). Oxford: Oxford University Press.

Mitchell, R. E. and Karchmer, M. A. (2004). 'Chasing the Mythical Ten Percent: Parental Hearing Status of Deaf and Hard of Hearing Students in the United States', *Sign Language Studies*, 4(2), pp. 138-168. <https://doi.org/10.1353/sls.2004.0005>

Morford, J.P. & Mayberry, R.I. (2000). 'A Reexamination of "Early Exposure" and its Implications for Language Acquisition by Eye', in Chamberlain, C., Morford, J.P. and Mayberry, R.I. (Eds.), *Language Acquisition by Eye* (pp. 111 – 128). Mahwah, NJ: Lawrence Erlbaum Associates.

Morford, J.P. (2002). 'Why does exposure to language matter? The evolution of language from pre-language' in Givon, T. and Malle, B. (Eds.) *The Evolution of Language out of Pre-Language*. Amsterdam: Benjamins.

Morgan, G., Meristo, M., Mann, W., Hjelmquist, E., Surian, L., and Siegal, M. (2014). 'Mental state language and quality of conversational experience in deaf and hearing children', *Cognitive Development*, 29, pp. 41-49. <https://doi.org/10.1016/j.cogdev.2013.10.002>

Morgan, G. (2015). 'On language acquisition in speech and sign: Development of combinatorial structure in both modalities', *Frontiers in Psychology: Language Sciences*, 5, pp. 1-8. <https://doi.org/10.3389/fpsyg.2014.01217>

National Geographic Education (2024). *Sign Language*. Available from: <https://education.nationalgeographic.org/resource/sign-language/>

Newport, E. L. and Meier, R. P. (1985). *The acquisition of American Sign Language*, Mahwah, NJ: Erlbaum.

Newport, E. L. (1990). 'Maturation constraints on language learning', *Cognitive Science*, 14(1), pp. 11–28. [https://doi.org/10.1016/0364-0213\(90\)90024-Q](https://doi.org/10.1016/0364-0213(90)90024-Q)

NHS Deaf Mental Health Working Group (2023). 'Shaping the future of deaf mental health', *SignHealth*. Available from: <https://signhealth.org.uk/wp-content/uploads/2023/07/Report-Shaping-the-future-of-deaf-mental-health.pdf>

Novogrodsky, R., Caldwell-Harris, C., Fish, S., and Hoffmeister, R.J. (2014). 'The Development of Antonym Knowledge in American Sign Language (ASL) and Its Relationship to Reading Comprehension in English', *Language Learning*, 64(4), pp. 749-770. <https://doi.org/10.1111/lang.12078>

Obrzut, J.E., Maddock, G.J. and Lee, C.P. (1999). 'Determinants of Self-Concept in Deaf and Hard of Hearing Children', *Journal of Developmental and Physical Disabilities*, 11, pp. 237-251. <https://doi.org/10.1023/A:1021848632322>

ONS (2021). *Language, England and Wales: Census 2021*. Available from: <https://www.ons.gov.uk/peoplepopulationandcommunity/culturalidentity/language/bulletins/languageenglandandwales/census2021>

Paul, P. V. (2000). *Language and deafness* (3rd ed.). Baltimore: Singular Publishing Group.

Petitto, L. A. (2000). 'The acquisition of natural signed languages: lessons in the nature of human language and its biological foundations' in *Language acquisition by Eye*, Chamberlain, C., Morford, J.P. and Mayberry, R.I. (eds.). Mahwah, NJ: Lawrence Erlbaum Associates.

Piao, Z., Lee, H., Mun, Y., Lee, H., and Han, E. (2023). 'Exploring the health literacy status of people with hearing impairment: a systematic review', *Archives of public health = Archives belges de sante publique*, 81(1), 206. <https://doi.org/10.1186/s13690-023-01216-x>

Pierce, L.J., Genesee, F., Delcenserie, A., and Morgan, G. (2017). 'Variations in phonological working memory: Linking early language experiences and language learning outcomes', *Applied Psycholinguistics*, 38 (6), pp.1265-1300. <https://doi.org/10.1017/s0142716417000236>

Pontecorvo, E., Higgins, M., Mora, J., Lieberman, A. M., Pyers, J., and Caselli, N. K. (2023). 'Learning a sign language does not hinder acquisition of a spoken language', *Journal of Speech, Language, and Hearing Research*, 66(4), pp. 1291-1308. https://dx.doi.org/10.1044/2022_JSLHR-22-00505

Public Health England (2017). *Chapter 6: Social determinants of health*. Available from: <https://www.gov.uk/government/publications/health-profile-for-england/chapter-6-social-determinants-of-health#child-development-and-educational-attainment>

Reinsberg, K. (undated). 'What is Social-Emotional Development?', *Ability Path: inspiring inclusion*. Available here: <https://abilitypath.org/ap-resources/what-is-social-emotional-development/>

Roberts, S. Wright, B. Moore, K. Smith, J. Allgar, V. Tennant, A. Doherty, C. Hughes, E. Moore, DC. Ogden, R. Phillips, H. Beese, L. and Rogers, K. (2015). 'Translation into British Sign Language and validation of the Strengths and Difficulties Questionnaire', *Health Services and Delivery Research*, 3(2). <https://doi.org/10.3310/hsdr03020>

- Rogers, K.D., Lovell, K., Bower, P., Armitage, C.J., and Young, A. (2025). 'What are Deaf sign language users' experiences as patients in healthcare services? A scoping review', *PLOS Global Public Health* 5(2). <https://doi.org/10.1371/journal.pgph.0003535>
- Rowley, K. (2020). Sign Language Acquisition. In S. Hupp & J. Jewell (Eds.), *The Encyclopedia of Child and Adolescent Development*. Wiley Blackwell.
- Rowley, K., Snoddon, K., & O'Neill, R. (2022). Supporting families and young deaf children with a bimodal bilingual approach. *International Journal of Birth and Parent Education*, 9(3), 15-20. <https://ijbpe.com/journals/volume-9/59-vol-9-issue-3>
- Sass-Lehrer, M. and Young, A. (2016). 'Evidence Based-Practice in Early Intervention: The Proof of the Pudding is in the Eating' in *Diversity in Deaf Education - Proceedings of the International Conference on the Education of the Deaf*, Athens, July 2015. Oxford: Oxford University Press.
- Schick, B., Marschark, M., and Spencer, P. (Eds.) (2005). *Advances in the sign language development of deaf children*. New York: Oxford University Press.
- Steinberg, A. (2000). 'Autobiographical narrative on growing up deaf' in Spencer, P.E., Erting, C.J., and Marschark, M. (Eds), *The Deaf Child in the Family and at School: Essays in Honor of Kathryn P. Meadow-Orlans*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Strong, M. and Prinz, P. (1997). 'A study of the relationship between American Sign Language and English literacy', *The Journal of Deaf Studies and Deaf Education*, 2(1), pp. 37-46. <https://doi.org/10.1093/oxfordjournals.deafed.a014308>
- Szarkowski, A., Moeller, M., Gale, E., Smith, T., Birdsey, B., Moodie, S., Carr, G., Stredler-Brown, A. and Yoshinaga-Itano, C. (2024). 'Family-Centred Early Intervention Deaf/Hard of Hearing (FCEI-DHH): Support Principles', *The Journal of Deaf Studies and Deaf Education*, 29(3), 442. <https://doi.org/10.1093/deafed/enad039>
- Thompson, R.A. and Virmani, E.A. (2012). 'Socioemotional Development' in Ramachandran, V.S. (Ed.) *Encyclopedia of Human Behavior* (2nd ed., 504-511). <https://doi.org/10.1016/B978-0-12-375000-6.00339-6>
- Traxler, M.J., Corina, D.P., Morford, J.P., Hafer, S., Hoversten, L.J., and NSF Science of Learning Center for Visual Language & Visual Learning (VL2) (2013). 'Deaf readers' response to syntactic complexity: Evidence from self-paced reading', *Memory & Cognition*, 42, pp. 97-111. <https://doi.org/10.3758/s13421-013-0346-1>
- Triggs, B. (2024). 'The eight reasons why literacy is more important than ever', *Bedrock Learning*. Available from: <https://bedrocklearning.org/literacy-blogs/the-eight-reasons-why-literacy-is-more-important-than-ever/>
- UNCRC (1989). 'The United Nations Convention on the Rights of the Child', *UNICEF UK*. Available from: https://www.unicef.org.uk/wp-content/uploads/2010/05/UNCRC_PRESS200910web.pdf

Wallis, D., Musselman, C., and MacKay, S. (2004). 'Hearing mothers and their deaf children: the relationship between American Sign Language and English literacy. Early, ongoing mode match and subsequent mental health functioning in adolescence', *The Journal of Deaf Studies and Deaf Education*, 9(1), pp. 2–14.

<https://doi.org/10.1093/deafed/enh014>

WHO (2020). *Adverse Childhood Experiences International Questionnaire (ACE-IQ)*.

Available from: [https://www.who.int/publications/m/item/adverse-childhood-experiences-international-questionnaire-\(ace-iq\)](https://www.who.int/publications/m/item/adverse-childhood-experiences-international-questionnaire-(ace-iq))

WHO (2021). *Health Promotion Glossary of Terms 2021*. Geneva: World Health Organization; 2021. Licence: CC BY-NC-SA 3.0IGO. Available from:

<https://iris.who.int/bitstream/handle/10665/350161/9789240038349-eng.pdf?sequence=1>

WHO (2021). *World Report on Hearing*. Available from:

<https://www.who.int/publications/i/item/9789240020481>

Young, A., Espinoza, F., Dodds, C., Squires, G., Rogers, K., Chilton, H., and O'Neill, R. (2023). 'Introducing the READY Study: DHH Young people's Well-Being and Self-Determination', *The Journal of Deaf Studies and Deaf Education*, 28(3), pp. 37–46.

<https://doi.org/10.1093/deafed/enad002>

Yoshinaga-Itano (2003). 'From Screening to Early Identification and Intervention: Discovering Predictors to Successful Outcomes for Children With Significant Hearing Loss', *The Journal of Deaf Studies and Deaf Education*, 8(1), pp. 11-30

<https://doi.org/10.1093/deafed/8.1.11>

Young, A.M., Carr, G., Hunt, R., McCracken, W., Skipp, A., and Tattersall, H. (2006). 'Informed choice and deaf children – underpinning concepts and enduring concerns', *The Journal of Deaf Studies and Deaf Education* 11(3), pp.322-336.

<https://doi.org/10.1093/deafed/enj041>

Young, A. and Tattersall, H. (2007). 'Universal Newborn Hearing Screening and early identification of deafness: parents' responses to knowing early and their expectations of child communication development', *The Journal of Deaf Studies and Deaf Education*, 12(2), pp. 209 - 220. <https://doi.org/10.1093/deafed/enl033>

Young, A.M., Gascon-Ramos, M., Campbell, M., and Bamford, J. (2009). 'The Design and Validation of a Parent-Report Questionnaire for Assessing the Characteristics and Quality of Early Intervention Over Time', *The Journal of Deaf Studies and Deaf Education*, 14(4), pp. 422-435. <https://doi.org/10.1093/deafed/enp016>