



How Bilingualism Contributes to Healthy Development in Deaf Children: A Public Health Perspective

Erin Wilkinson¹ · Jill P. Morford¹

Published online: 6 July 2020

© Springer Science+Business Media, LLC, part of Springer Nature 2020

Abstract

The aim of this article is to increase awareness of language practices in the deaf community that affect communication needs and health outcomes, focusing particularly on the prevalence of bilingualism among deaf adults. Language deprivation and poor health outcomes in the deaf population are risks that cannot be addressed solely by hearing intervention. We propose that bilingualism acts as a protective measure to minimize the health risks faced by deaf individuals. Provision of culturally and linguistically appropriate services to deaf stakeholders, and particularly hearing families of deaf children, requires familiarity with the developmental and social ramifications of bilingualism.

Keywords Bilingualism · Sign language · Hearing loss · Health disparities · CLAS

Significance

What is already known on this subject? The majority of deaf individuals are bilingual in a signed and a spoken/written language, but the needs of this population have yet to be addressed with respect to eliminating health inequalities that affect minority populations.

What this study adds? This article provides an overview of deafness and bilingualism as an avenue for increasing awareness of language practices in the deaf community that may influence communication needs and health outcomes.

Growing awareness of bilingualism in the US population has spurred policy developments to address the unique health needs of individuals who use more than one language in daily life. Specifically, the U.S. Department of Health and Human Services now provides guidance to health care professionals through national standards for culturally and linguistically appropriate services (CLAS) in order to eliminate health inequalities that affect minority populations (<https://thinkculturalhealth.hhs.gov/clas>). The purpose of these standards is to advance health equity, to improve quality of health care, and to help eliminate disparities. However, these guidelines have not explicitly acknowledged

members of the deaf community as a target population, despite the fact that the majority of deaf individuals are bilingual in a signed and a spoken/written language. In this article, we provide an overview of deafness and bilingualism as an avenue for increasing awareness of language practices in the deaf community that may influence communication needs and health outcomes. First, we provide a brief overview of recent research on bilingualism and deafness. Second, we explain how bilingualism can function as a protective measure to minimize the risk of language deprivation and barriers to accessing to health information. Physicians who are interested in learning more about this topic, including evidence-based responses to frequent questions from parents are referred to a series of articles by Humphries and colleagues that systematically address the importance of early and accessible language exposure for children who are deaf or hard-of-hearing (Humphries et al. 2012, 2014a, b, 2016, 2019).

The Deaf Community is a Bilingual Community

For much of the twentieth century, bilingualism was viewed within the United States with skepticism, either due to the fear that individuals who spoke languages other than English might have divided loyalties (Joseph 2016), or due to a long-held misconception that bilingualism interfered

✉ Erin Wilkinson
ewilkins@unm.edu

¹ Department of Linguistics, MSC03 2130, University of New Mexico, Albuquerque, NM 87131-0001, USA

with language development and processing (Roberts 1939). Recently, however, bilingualism has become popular in science and in the broader public. The demand for bilingual education by monolingual families has far outstripped supply (García Mathewson 2017). Two important insights to emerge from the recent attention to bilingualism are that (1) children acquiring two languages simultaneously do not experience confusion or conflict between them (Guiberson 2013; Hoff and Core 2015), and (2) bilingual adults effectively process language even though both languages are always active, even in monolingual settings (Dijkstra and Van Heuven 2002; Kroll et al. 2014). These findings suggest that there is no *cost* to bilingualism in terms of developmental or cognitive outcomes. For minority communities, however, there are considerable physical and mental health *benefits* to knowing and maintaining connections to minority languages and cultures (Schachter et al. 2012; Whalen et al. 2016). When considering the deaf community, what are the “costs” and “benefits” of bilingualism?

As a medical practitioner discussing bilingualism with members of the public, it is important to be familiar with common misconceptions (Grosjean 2010). For example, within the US, it is still common to believe that being monolingual is “normal” and being bilingual is not. Many people also assume that the term “bilingual” only refers to people who have equal and full proficiency in two languages. These common misconceptions are not supported by demographic studies. In fact, just the opposite is the case (Grosjean 2010). Bilingualism is the norm today in most parts of the world outside the US, and it is rare for bilinguals to have equal proficiency levels in their two languages. Instead, bilinguals often shift in language proficiency across the lifespan depending on how frequently and for what purposes they use each language. For example, bilingual children may know the word for “pajamas” in only one language, because they only need to say this word at home; by contrast, they are likely to know a phrase like “Look at me!” in both languages since they need to coordinate attention with others in every context. Another common misconception about bilingualism is that bilingual children are delayed relative to monolingual children. This perspective may arise from comparisons of bilinguals and monolinguals on the language used by the monolingual (i.e., assessments in English only). Such comparisons ignore part of the bilingual’s language competency, and can reinforce discriminatory views that minority languages are less valuable or important than the dominant language in a society.

The evidence drawn from many studies of bilingual language development indicates that children acquiring two languages are not confused or substantially delayed by bilingual input (Guiberson 2013). Studies comparing vocabulary development of monolingual and bilingual

children that evaluate both languages of bilinguals demonstrate that the rate of vocabulary development is not an essential difference between the two groups (Bedore et al. 2005; Patterson and Pearson 2004; Pearson et al. 1993; Petitto et al. 2001). Further, bilingual children are less likely to be inappropriately identified as language disordered if both languages are included in language assessments (Core et al. 2013). Some people worry that exposure to two languages can be confusing, and refer to mixed utterances with derogatory terms, such as “Spanglish”. Episodes of code-switching, or *code-blending* in the case of a signed and a spoken language, are a natural behavior of bilinguals, and even evidence that speakers are sensitive to grammatical and sociolinguistic constraints in both languages (Baker and Van den Bogaerde 2008; Meisel 1994). Mixed utterances are not an indication that bilingual children are confused.

Grammatical development in bilingual children, like vocabulary development, is influenced by amount of exposure to each language (Thordardottir 2015). When exposure is unbalanced, then bilingual grammatical development keeps pace with monolingual development only in the dominant language. However, when bilingual children have balanced exposure to two languages, their grammatical development in each language falls within the (admittedly highly variable) monolingual norms. Bilingual children’s grammatical competence is not *identical* to monolingual children’s because their language competence is distributed across two languages (Hoff and Core 2015). Some studies identify areas of earlier or faster development in bilinguals that arise as a result of being exposed to multiple language systems, such as earlier metalinguistic awareness, faster lexical development in some instances, and greater cognitive flexibility (Bialystok and Feng 2009) as well as increased attentional and inhibitory control (Costa et al. 2008).

Being Bilingual in a Signed and Spoken/ Written Language

There is a long tradition of bilingualism in the deaf community, but only recently have scientists and community members considered knowledge of a signed and a spoken/ written language to be a form of bilingualism. For example, in the US, most deaf adults use both American Sign Language (ASL) and English every day. Deafness is also associated with a risk of language delay (Yoshinaga-Itano et al. 2017) and language deprivation (Hall 2017), and this concern should be central to initial discussions about language and development of deaf children in medical settings. The early hearing detection and intervention (EHDI) guidelines (hearing screening by 1 month, diagnosis of hearing loss by 3 months, and intervention by 6 months of age) are designed to promote early exposure to language

for deaf infants. Language delay and language deprivation are caused by insufficient exposure to language, not by hearing loss per se (Hall 2017). Yoshinaga-Itano and colleagues found that achieving all three targets of the EHDI guidelines is a significant predictor of vocabulary size of deaf toddlers ages 8–39 months, whether parents use spoken language, signed language or both. Physicians and families may not realize that early exposure to language is essential for all language development, including signed language. For a deaf child, the late addition of a signed language is not adequate for healthy language development. Signed language development, just like spoken language development, requires early, high quality language input (Mayberry et al. 2002; Morford and Hänel-Faulhaber 2011). Language fluency in each language of a bilingual depends upon the amount of exposure the child experiences. The framing of initial discussions about hearing and language outcomes with parents of deaf infants is critical to their ability to make an informed decision.

Physicians and families may make faulty assumptions that language access will be resolved by improving access to sound, but no currently available interventions for hearing loss can guarantee sufficient exposure to language through audition alone (Humphries et al. 2012; Niparko et al. 2010; Pisoni et al. 2011). The risk of language deprivation makes it essential to identify and adopt a plan to ensure exposure to *language*, not sound, as early as possible regardless of the approach taken to address hearing intervention (Hall 2017). Exposure to both a signed and a spoken/written language is one way to guarantee accessible language input. Hearing families may feel more comfortable focusing on a spoken language that they already know; this decision, however, places the burden on the deaf child to acquire a language that may not be fully accessible. Exposure to a signed language will involve more work for hearing parents who will need to take classes or invite individuals fluent in sign into their home, but it is one way that parents can accommodate to the needs of their deaf child, sharing the effort to create accessibility and shared communication for all members of the family.

A common misconception is that exposure to both a signed and a spoken/written language could cause confusion. Humphries et al. (2014a) conducted a meta-analysis of prior studies on developmental language skills in deaf children to investigate whether there are effects of sign language acquisition that detrimentally affect their acquisition of spoken and written languages. They found no evidence that sign language acquisition is harmful to the acquisition of a spoken/written language. On the contrary, numerous studies indicate that exposure to each language can promote development of the other (Davidson et al. 2014; Hassanzadeh 2012; Krausneker 2008; Mounty et al. 2014; Watkins et al. 1998; Yoshinaga-Itano 2006).

Studies of deaf bilingual adults provide additional support for the idea that there is little cost, and much to gain, by promoting bilingualism in the deaf population. Research demonstrates that bilingualism is largely comparable in hearing and deaf bilinguals. In fact, the inclusion of deaf bilinguals in research on bilingualism has heralded new insights into the nature of bilingualism. One of the most important findings to emerge from the recent investigation of bilingualism is that bilinguals' two languages are always active, even in monolingual settings (Dijkstra and Van Heuven 2002; Kroll et al. 2014). Studies of deaf bilinguals have enhanced our understanding of this phenomenon. When bilinguals read, listen to, or speak one of their languages, psychologists find evidence in their behavior and brain activation patterns indicating that the other language was also active (e.g., Hoshino and Kroll 2008; Marian and Spivey 2003; Thierry and Wu 2007; Wu and Thierry 2010). The same is true for deaf bilinguals, even though their two languages don't share words that sound alike or that are written alike (Meade et al. 2017; Morford et al. 2011; Quandt and Kubicek 2018). Research on deaf ASL-English bilinguals has been replicated and extended to signers of other signed languages, including German Sign Language (Kubuş et al. 2015), Italian Sign Language (Bonsignori and Demestre 2018), and Mexican Sign Language (Mendoza and Jackson Maldonado 2020). Although deaf bilinguals were activating two languages during these studies, they completed the task as fast or faster than the hearing monolingual control group. In other words, adult signing bilinguals are highly efficient at processing their languages, even when they are activating more word forms than monolinguals in the same situation.

Very little is known about language processing skills in bilingual children relative to bilingual adults. One recent study attempted to address this gap by investigating whether deaf school-aged children activate signs while reading English words. Wilkinson et al. (2018) presented deaf and hearing middle school students with pairs of English words and asked them to decide whether the words were related in meaning or not. Like bilingual adults, the deaf children processed the English words differently if their ASL translations looked similar compared to when they did not. Hearing children with no knowledge of ASL did not show the same distinction in processing. An unexpected finding of the study was that the deaf bilingual children were significantly faster than the hearing monolingual children, even though the task was entirely in English. The investigators attributed this latter finding to optimized visual attention in the deaf participants.

Taking a closer look at the language profile of middle school ASL-English bilinguals, Amador et al. (2019) found that different factors were associated with proficiency in ASL and English for deaf children with hearing vs. deaf

parents. The strongest predictor of ASL proficiency among deaf children with *hearing* parents was how many family members signed at home. Frequently, deaf children will rely on a single family member, often the mother or a sibling, to communicate with others. Amador et al.'s findings suggest that deaf children with families who are just learning to sign have the best chance of strong mastery of a signed language when the whole family joins in.

By contrast, deaf children with *deaf* parents showed little influence of this factor due to the consistency across such families in the high level of signing proficiency. However, deaf children with deaf parents exhibited stronger ASL skills if they attended a pre-school where ASL was a language of instruction. Similarly, Henner et al. (2016) report that ASL proficiency is greater in deaf children learning ASL from their deaf parents if they attend schools where ASL is a language of instruction prior to the age of 12. These are the first studies to report that deaf children with deaf parents cannot simply rely on parental input for strong language outcomes in their children. Exposure at home is ideal, but language development is enriched by exposure to language in other settings as well. Physicians caring for deaf children from signing deaf families should keep in mind that hearing bilingual children acquiring spoken languages benefit from increased opportunities to use both languages. The results from Amador and colleagues suggest that deaf children acquiring ASL at home will have stronger proficiency in ASL if they are also exposed to ASL outside the home.

The English proficiency of the deaf children with hearing parents in the Amador et al. study was positively associated with parent education level. Comparable effects have been reported for hearing children acquiring spoken languages (Hoff-Ginsberg 1991). Korat and colleagues (2013) propose that the home literacy environment of higher socioeconomic status parents provides many more opportunities for children to engage in literacy activities, and hence, to become familiar with written words. This may be particularly important for deaf children's acquisition of the spoken/written language of their home since books provide a visual model of the spoken language their parents use every day as a primary language. By contrast, there was no single factor that was strongly associated with the English proficiency level of the deaf children with deaf parents. Recall that English proficiency was higher for deaf children with deaf parents than for deaf children with hearing parents. The lack of association between demographic variables such as parent education and type of school with English proficiency levels suggests that deaf children with deaf parents do not follow a single path to proficiency in the spoken/written language of their communities as other children might. Some deaf parents may have sufficient knowledge of speech to teach their children English through spoken interactions; some may use fingerspelling to create links between English

orthography and ASL knowledge; some may rely primarily on reading; others may expect their children to learn English at school. Whatever the avenue to learning the spoken/written language, the generally higher level of English proficiency in deaf children with deaf parents suggests that early exposure to ASL enhances the later mastery of another language, in this case English (Mayberry and Lock 2003).

To summarize, bilingualism is the norm in the deaf community. When deaf infants are exposed from an early age to a rich model of both a spoken/written and a signed language, they can master both languages with support from their families and communities (Davidson et al. 2014). There are many studies that indicate that each language is enhanced by development of the other language, and that early exposure is the most important factor in ensuring high levels of language proficiency for both spoken/written and signed languages (Mayberry and Lock 2003). Each family must carefully consider a communication approach that fits their child and their family, taking into account that improvements in "hearing" do not guarantee improvements in "language" for deaf children. Bilingualism is an option that protects against the risks of language delay and language deprivation.

The goal of the culturally and linguistically appropriate services (CLAS) guidelines is to eliminate disparities in health care. In order to achieve this goal for the deaf community, it is necessary to improve early detection not only of hearing loss, but also of language delay or risk of language deprivation. Similarly, it is essential to increase disease prevention by implementing practices that minimize the risk of language deprivation and linguistic isolation. We turn now to a discussion of the consequences of poor language outcomes in childhood for health outcomes in deaf adults.

Importance of Language for Health Literacy and Health Outcomes

For hearing parents who have just learned that their newborn is deaf, deciding whether to teach their child a spoken language, a signed language, or both may seem to be primarily about how they will communicate with their child, and what type of schools their child will attend. However, the implications are much greater, and will extend across the lifespan. Deaf people suffer some of the poorest health statuses and health outcomes of the general population in the US (Barnett 1999). This includes higher prevalence of cardiovascular diseases (Smith et al. 2015), depression and anxiety (Hindley et al. 1994), domestic violence (Merkin and Smith 1995), sexually transmitted diseases (Pick 2013) and more limited access to health services (Barnett and Franks 2002).

There are several reasons for these poor health outcomes, but they are not attributable to an inability to perceive sound, *per se*. Language and communication barriers, by contrast, pose a serious and lifelong threat to health literacy and knowledge, and to the development of healthy lifestyle practices. Navigating the health care system is heavily dependent upon linguistic skills needed for communicating during appointments, and for understanding the diagnosis and treatment described by physicians. Language deprivation undermines patient-physician relationships, and can impact higher cognitive functions such as memory, abstract reasoning and executive function that are essential for engagement in their own medical care. McKee et al. (2015) found that deaf patients were 6.9 times more likely to have lower general health knowledge compared to hearing patients, suggesting linguistic and social barriers contribute to inadequate knowledge about health.

A simple and effective way to improve health outcomes is for physicians to recommend to parents of deaf children that they request an interpreter during medical appointments with their deaf child even if they—the parents—do not need an interpreter to interact with the physician. Interpreters support the developing self-efficacy of deaf children by allowing them to participate in their own health care, learn the purpose and structure of visits to the doctor, and observe appropriate dialogue in the medical setting. Interpreters can help parents to maintain clear communication in a context where they may feel overwhelmed by the healthcare decisions they are faced with. Finally, parents can learn from interpreters how to talk about the body and health-related topics with their child, which can positively impact treatment fidelity and future interactions around illness and health in the home environment.

Hearing people acquire as much as 70–90% of their knowledge through incidental learning opportunities (Marsick and Watkins 2001), such as overhearing family members or friends discussing a decision or an experience, or how they responded to a certain situation. Most deaf individuals do not have the opportunity to benefit from these unplanned learning opportunities. Instead, deaf individuals are accustomed to experiencing the “dinner table syndrome” where they are surrounded by people who are conversing in a spoken language, and they are left out and unable to participate in the interaction (Hall et al. 2018, p. 2). This experience affects all deaf individuals regardless of type or degree of hearing loss and language use (Convertino et al. 2014). Even hearing people have difficulties understanding spoken conversation in some settings. That experience is magnified for deaf individuals. Deaf communities have responded to this characteristic of deaf experience by intentionally sharing newly acquired information that others may not be aware of. A deaf person who socializes primarily with hearing people may not even realize that gaps in

information are a common experience for deaf individuals, and that it is possible to develop pro-active behaviors to share information that is not as widespread.

The effect of lost opportunities for incidental learning is particularly harmful when communication barriers exist between parents and their deaf children. For example, when deaf children are experiencing illness, they will not be able to learn about prevention and treatment from their parents’ explanations if they do not have a shared language, or if parents struggle to communicate with their child. Further, a lack of easy communication with parents makes it less likely that deaf teenagers will ask questions about sensitive topics such as sexually transmitted diseases. Finally, many deaf adults have limited awareness of their family medical history due to missing out on family conversations about medical issues of various relatives and family members (Barnett 1999).

When physicians and families are discussing intervention options for deaf children, physicians need to help families understand the connection between communication patterns at home and their deaf child’s health and well-being. Decisions about the languages that deaf children will learn in early life rarely involve deaf people themselves. Instead, parents typically rely on medical experts for advice on how to communicate with their deaf children. Paradoxically, the people deciding what languages deaf children will use have minimal experience interacting with deaf people. What many do not realize is that the language choices that physicians and parents make on behalf of deaf children ultimately impacts the health and well-being of deaf adults.

Bilingualism as a Protective Factor

How can physicians facilitate the development of clear communication in families with deaf children and promote positive health outcomes for deaf individuals across the lifespan? We propose that bilingualism can be a protective factor when viewing deafness in a public health perspective. The greatest health risks to deaf children are language deprivation and lack of access to health information through poor communication. Bilingualism promotes maximum access to language and social networks. Once language fluency is established in two or more languages, and social networks are robust, deaf individuals can choose for themselves which languages to use in which contexts. Bilingualism is empowering to deaf individuals. Social networking in the deaf community is the gateway for deaf children who acquire a signed language not only to learn the language, but also to gain access to the accumulated knowledge of the deaf community about how to function in society as a deaf person with respect to both the physical and social

dimensions of deafness. The well-being of deaf people is intrinsically tied to their social connections through which they share their deaf experiences. Knowing a language that is fully accessible to deaf people gives deaf children the opportunity to benefit from generations of experience.

Hearing people often perceive deafness as a form of sensory “deprivation”—but an individual who has never experienced audition does not notice any *loss* of sensory input. Individuals who are deaf across the lifespan interpret experience through the existing sensory modalities, particularly the visual modality (Hauser et al. 2010). Deaf people engage in highly adaptive behaviors in order to function effectively with the sensory input that is accessible to them. These adaptive behaviors are shared through social networks of deaf individuals, which is why knowledge of a signed language impacts quality of life across the lifespan.

Networks of formative social relationships are the source of *social capital*, that is, the benefits accruing to an individual through social networks on the basis of reciprocity and trust. Individuals participate in many different social networks. Some are groups of highly familiar people who bolster our sense of identity and self, while others include more diverse sets of people and encourage us to broaden our identity and to tap new sources of social power and recognition (Putnam 2000). Wilkens and Hehir (2008) found that greater language proficiency was associated with a stronger ability to build social networks, and subsequently, with greater social capital in deaf and hard-of-hearing adolescents. In a study of 107 middle-aged and older deaf adults, Gerich and Fellingner (2012) found that a higher quality of life was correlated with social network size, whether the composition of the network was deaf or hearing. Moreover, the size of deaf and hearing networks were correlated. However, it was the size of the deaf networks that best accounted for variation in quality of life scores. In other words, deaf adults who have large social networks of deaf people report the highest quality of life, and are more likely to develop and maintain larger social networks of hearing people as well. Networks of social relationships among deaf people may be perceived by hearing people as limited and impoverished. Thus, it might be tempting to conclude that deaf people who use signed languages have weaker social capital, mostly because they may not be integrated into hearing communities and because of the relatively small and scattered population of sign language users. Despite the sparse distribution of deaf people, however, the scarcity of opportunities to interact with other individuals fluent in a signed language can actually act to strengthen social capital—it motivates the community to be more tightly knit and supportive as community members typically seek each other out. And as the results of Gerich and Fellingner demonstrate, social capital in one community promotes obtaining social capital in other communities.

While bilingualism can function as a protective factor, there are negative impacts of the disparagement of signed languages within medical settings or social contexts. The literature has amply demonstrated that the lack of access to information in the languages preferred by minority linguistic communities has a harmful impact on their health and well-being (Benoît and Van Kemenade 2017; Pick 2013; Steinberg et al. 2006). Signed languages are even more susceptible than other minority languages to being undervalued. Not providing information translated into signed languages reflects an attitude and perspective of the medical profession of not valuing deaf people. In other words, a lack of signed language materials is a form of rejection of deaf people’s well-being, including their physical health, by the medical profession, which leads to serious consequences for deaf people. Similarly, when parents of deaf children try to prevent their children from being exposed to signed languages, this contributes to language shaming and cultural rejection of deaf people and the deaf community. This language ideology even permeates the linguistic minority of sign language users such that some deaf people themselves take the view that their signed language is subpar, even if it has legal protections, compared to the dominant spoken/written language (Haualand and Holmström 2019). By contrast, a family’s openness to bilingualism conveys their acceptance of deafness, the ways of the deaf community, and the language of the deaf community. This communicates to deaf children that their families accept and embrace them.

The societal response to deafness can also convey implicit negative messages to deaf children, from the assumption that deaf people should adapt their behaviors to “fit” with the hearing majority, to the high praise afforded deaf individuals who produce comprehensible speech. These societal behaviors shape the way that deaf people view the world, and their place in that world. As with other minority communities, some deaf people have pushed back against societal prejudice, and formed ways of being that are rooted in respect and acceptance of each other’s difference from the societal norms. Building networks of social relationships that are affirming, for example, is one way that some members of deaf communities resist *othering* by individuals and groups unfamiliar with deafness, or negatively inclined toward deafness.

The debate on the habilitation of deaf people has traditionally revolved around how to “integrate” deaf people into hearing society, and for many, speech is perceived as the gateway for deaf people to elevate their quality of life. By this view, it is appropriate for deaf children to allocate all of their cognitive capacity to learning speech. However, this framing places the burden on deaf people, not hearing people, since deaf people are left to accommodate hearing non-signers, not only by using a language production mode that is poorly-matched to their sensory experience,

but also through the tacit assumption that they will “fill in communication gaps and expend considerable cognitive load deciphering those gaps” (Blankmeyer Burke 2015) when the hearing non-signer’s speech is not fully comprehensible. A new perspective to emerge from deaf philosophy and bioethics is that it is not just a question of whether deaf children *can* acquire spoken language, but what social and linguistic conditions contribute to a “*flourishing deaf life*” (Blankmeyer Burke 2011, 2015). What can parents of deaf children do to support their physical and cognitive development, and also their social well-being and sense of themselves as valued individuals? Blankmeyer Burke argues that discarding the option of a flourishing deaf life, even if unintentional, is an “incalculable loss” not only for individuals but also their community and the society at large. Blankmeyer Burke’s (2015) analysis of the impact on deaf people of the lack of access to signed languages resonates with what has been discussed about linguistic vitality and public health in other populations.

In closing, bilingualism is widespread across the globe, and is the norm in the deaf community. Children acquire multiple languages with little difficulty as long as they have early and regular access to those languages. Acquisition of signed languages by deaf children has predictable positive developmental outcomes; acquisition of spoken languages by deaf children has variable outcomes, and positive outcomes are not guaranteed by hearing intervention. The benefits of bilingualism to identity formation and to the development of social capital across multiple communities for deaf individuals are incalculable. An inability to perceive sound does not cause the poor health outcomes documented in the deaf population; the greatest risk to health and well-being of deaf people is the risk of language deprivation and the risk of being isolated due to communication barriers. Bilingualism empowers deaf individuals to choose for themselves the life that will allow them to flourish.

References

- Amador, B., Morford, J.P., Wilkinson, E., & A. Villwock. (2019). *Predicting language proficiency of deaf children*. Paper presented at the 44th Boston University Conference on Language Development, Boston University, Boston, MA.
- Baker, A. E., & van den Bogaerde, B. (2008). Code-mixing in signs and words in input to and output from children. In C. Plaza-Pust & E. Morales-López (Eds.), *Sign bilingualism: language development, interaction, and maintenance in sign language contact situations* (pp. 1–27). Amsterdam: John Benjamins Publishing. <https://doi.org/10.1075/sibil.38>.
- Barnett, S. (1999). Clinical and cultural issues in caring for deaf people. *Family Medicine*, 31(1), 17–22.
- Barnett, S., & Franks, P. (2002). Health care utilization and adults who are deaf: relationship with age at onset of deafness. *Health Services Research*, 37(1), 105–120.
- Bedore, L. M., Peña, E. D., García, M., & Cortez, C. (2005). Conceptual versus monolingual scoring: when does it make a difference? *Language, Speech, and Hearing Services in Schools*, 36(3), 188–200. [https://doi.org/10.1044/0161-1461\(2005/020\)](https://doi.org/10.1044/0161-1461(2005/020)).
- Benoît, J., & Van Kemenade, S. (2017). *Accessibility and active offer: health care and social services in linguistic minority communities* (Drolet M., Bouchard P., & Savard J., Eds.). University of Ottawa Press. <https://www.jstor.org/stable/j.ctv5vdcxc>.
- Bialystok, E., & Feng, X. (2009). Language proficiency and executive control in proactive interference: evidence from monolingual and bilingual children and adults. *Brain and Language*, 109, 93–100.
- Blankmeyer Burke, T. (2011). The quest for a deaf child: ethics and genetics. Unpublished Doctoral Dissertation, University of New Mexico.
- Blankmeyer Burke, T. (2015). About us, without us: inclusion in the threat of eradication. *Impact Ethics*. <https://impactethics.ca/2015/12/08/about-us-without-us-inclusion-in-the-threat-of-eradication/>.
- Bonsignori, C., & Demestre, J. (2018). *Cross-language activation in deaf Italian Sign Language (LIS) - Italian bilinguals*. Paper presented at the Fourth St. Petersburg Winter Workshop on Experimental Studies of Speech and Language.
- Convertino, C., Borgna, G., Marschark, M., & Durkin, A. (2014). Word and world knowledge among deaf learners with and without cochlear implants. *Journal of Deaf Studies and Deaf Education*, 19(4), 471–483. <https://doi.org/10.1093/deafed/enu024>.
- Core, C., Hoff, E., Rumiche, R., & Señor, M. (2013). Total and conceptual vocabulary in Spanish-English bilinguals from 22 to 30 months: implications for assessment. *Journal of Speech, Language & Hearing Research*, 56(5), 1637–1649. [https://doi.org/10.1044/1092-4388\(2013/11-0044\)](https://doi.org/10.1044/1092-4388(2013/11-0044)).
- Costa, A., Hernández, M., & Sebastián-Gallés, N. (2008). Bilingualism aids conflict resolution: evidence from the ANT task. *Cognition*, 106, 59–86.
- Davidson, K., Lillo-Martin, D., & Chen Pichler, D. (2014). Spoken English language development among native signing children with cochlear implants. *Journal of Deaf Studies and Deaf Education*, 19(2), 238–250. <https://doi.org/10.1093/deafed/ent045>.
- Dijkstra, A., & Van Heuven, W. J. B. (2002). The architecture of the bilingual word recognition system: From identification to decision. *Bilingualism: Language and Cognition*, 5, 175–197.
- García Mathewson, T. (2017). Rising popularity of dual-language education could leave Latinos behind. *The Hechinger Report*. <https://hechingerreport.org/rising-popularity-dual-language-education-leave-latino-behind/>.
- Gerich, J., & Fellingner, J. (2012). Effects of social networks on the quality of life in an elder and middle-aged deaf community sample. *Journal of Deaf Studies and Deaf Education*, 17, 102–115. <https://doi.org/10.1093/deafed/enr022>.
- Grosjean, F. (2010). *Bilingual: life and reality*. Cambridge: Harvard University Press.
- Guiberson, M. (2013). Bilingual myth-busters series: language confusion in bilinguals. *Perspectives on Communication Disorders in Culturally and Linguistically Diverse Populations*, 20, 5–14.
- 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), 961–965. <https://doi.org/10.1007/s10995-017-2287-y>.
- Hall, W. C., Smith, S. R., Sutter, E. J., DeWindt, L. A., & 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), e020169.
- Hassanzadeh, S. (2012). Outcomes of cochlear implantation in deaf children of deaf parents: comparative study. *The Journal*

- of *Laryngology & Otolaryngology*, 126(10), 989–994. <https://doi.org/10.1017/S0022215112001909>.
- Haualand, H., & Holmström, I. (2019). When language recognition and language shaming go hand in hand—sign language ideologies in Sweden and Norway. *Deafness & Education International*, 21(2–3), 99–115. <https://doi.org/10.1080/14643154.2018.1562636>.
- Hauser, P. C., O'Hearn, A., McKee, M., Steider, A., & Thew, D. (2010). Deaf epistemology: deafhood and deafness. *American Annals of the Deaf*, 154(5), 486–492. <https://doi.org/10.1353/aad.0.0120>.
- Henner, J., Caldwell-Harris, C. L., Novogrodsky, R., & Hoffmeister, R. (2016). American Sign Language syntax and analogical reasoning skills are influenced by early acquisition and age of entry to signing schools for the deaf. *Frontiers in Psychology*. <https://doi.org/10.3389/fpsyg.2016.01982>.
- Hindley, P. A., Hill, P. D., McGuigan, S., & Kitson, N. (1994). Psychiatric disorder in deaf and hearing impaired children and young people: a prevalence study. *Child Psychology & Psychiatry & Allied Disciplines*, 35(5), 917–934. <https://doi.org/10.1111/j.1469-7610.1994.tb02302.x>.
- Hoff, E., & Core, C. (2015). What clinicians need to know about bilingual development. *Seminars in Speech and Language*, 36(2), 89–99. <https://doi.org/10.1055/s-0035-1549104>.
- Hoff-Ginsberg, E. (1991). Mother–child conversation in different social classes and communicative settings. *Child Development*, 62, 782–796.
- Hoshino, N., & Kroll, J. F. (2008). Cognate effects in picture naming: does cross-language activation survive a change of script? *Cognition*, 106(1), 501–511. <https://doi.org/10.1016/j.cognition.2007.02.001>.
- Humphries, T., Kushalnagar, P., Mathur, G., Napoli, D. J., Padden, C., Rathmann, C., et al. (2012). Language acquisition for deaf children: reducing the harms of zero tolerance to the use of alternative approaches. *Harm Reduction Journal*. <https://doi.org/10.1186/1477-7517-9-16>.
- Humphries, T., Kushalnagar, P., Mathur, G., Napoli, D. J., Padden, C., & Rathmann, C. (2014a). Ensuring language acquisition for deaf children: what linguists can do. *Language*, 90(2), e31–e52. <https://doi.org/10.1353/lan.2014.0036>.
- Humphries, T., Kushalnagar, P., Mathur, G., Napoli, D. J., Padden, C., Rathmann, C., et al. (2014b). Bilingualism: a pearl to overcome certain perils of cochlear implants. *Journal of Medical Speech-Language Pathology*, 21, 107–125.
- Humphries, T., Kushalnagar, P., Mathur, G., Napoli, D. J., Padden, C., Rathmann, C., et al. (2016). Language choices for deaf infants: advice for parents regarding sign language. *Clinical Pediatrics*, 59, 513–517.
- Humphries, T., Kushalnagar, P., Mathur, G., Napoli, D. J., Rathmann, C., & Smith, S. (2019). Support for parents of deaf children: common questions and informed, evidence-based answers. *International Journal of Pediatric Otorhinolaryngology*, 118, 134–142. <https://doi.org/10.1016/j.ijporl.2018.12.036>.
- Joseph, J. E. (2016). Divided allegiance. *Historiographia Linguistica*, 43(3), 343–362. <https://doi.org/10.1075/hl.43.3.04jos>.
- Korat, O., Arafat, S. H., Aram, D., & Klein, P. (2013). Book reading mediation, SES, home literacy environment, and children's literacy: evidence from Arabic-speaking families. *First Language*, 33(2), 132–154.
- Krausnecker, V. (2008). Language use and awareness of deaf and hearing children in a bilingual setting. In C. Plaza-Pust & E. Morales-Lopez (Eds.), *Sign bilingualism: language development, interaction and maintenance in sign language contact situations* (pp. 195–222). Amsterdam: John Benjamins Publishing. <https://doi.org/10.1075/sibil.38>.
- Kroll, J. F., Bobb, S. C., & Hoshino, N. (2014). Two languages in mind: Bilingualism as a tool to investigate language, cognition, and the brain. *Current Directions in Psychological Science*, 23(3), 159–163. <https://doi.org/10.1177/0963721414528511>.
- Kubus, O., Villwock, A., Morford, J. P., & Rathmann, C. (2015). Word recognition in deaf readers: cross-language activation of German Sign Language and German. *Applied Psycholinguistics*, 36(4), 831–854. <https://doi.org/10.1017/S0142716413000520>.
- Marian, V., & Spivey, M. J. (2003). Competing activation in bilingual language processing: within- and between-language competition. *Bilingualism: Language and Cognition*, 6, 97–115.
- Marsick, V. J., & Watkins, K. J. (2001). Informal and incidental learning. *New Directions for Adult and Continuing Education*, 89, 25–34. <https://doi.org/10.1002/ace.5>.
- Mayberry, R. I., & Lock, E. (2003). Age constraints on first versus second language acquisition: evidence for linguistic plasticity and epigenesis. *Brain and Language*, 87, 369–383.
- Mayberry, R. I., Lock, E., & Kazmi, H. (2002). Linguistic ability and early language exposure. *Nature*, 417, 38.
- McKee, M. M., Paasche-Orlow, M. K., Winters, P. C., Fiscella, K., Zazove, P., Sen, A., et al. (2015). Assessing health literacy in deaf american sign language users. *Journal of Health Communication*, 20(2), 92–100. <https://doi.org/10.1080/10810730.2015.1066468>.
- Meade, G., Midgley, K. J., Sevcikova Sehyr, Z., Holcomb, P. J., & Emmorey, K. (2017). Implicit co-activation of American Sign Language in deaf readers: an ERP study. *Brain and Language*, 170, 50–61. <https://doi.org/10.1016/j.bandl.2017.03.004>.
- Meisel, J. (1994). Code-switching in young bilingual children: the acquisition of grammatical constraints. *Studies in Second Language Acquisition*, 16(4), 413–439. <https://doi.org/10.1017/S0272263100013449>.
- Mendoza, E., & Jackson Maldonado, D. (2020). Lectura de palabras por personas sordas usuarias de lengua de señas mexicana. *Revista de Logopedia, Foniatría y Audiología*, 40, 4–11. <https://doi.org/10.1016/j.rlfa.2019.05.003>.
- Merkin, L., & Smith, M. J. (1995). A community based model providing services for deaf and deaf-blind victims of sexual assault and domestic violence. *Sexuality and Disability*, 13, 97–106. <https://doi.org/10.1007/BF02590059>.
- Morford, J. P., & Hänel-Faulhaber, B. (2011). Homesigners as late learners: connecting the dots from delayed acquisition in childhood to sign language processing in adulthood. *Linguistics and Language Compass*, 5(8), 525–537.
- Morford, J. P., Wilkinson, E., Villwock, A., Piñar, P., & Kroll, J. F. (2011). When deaf signers read English: do written words activate their sign translations? *Cognition*, 118(2), 286–292. <https://doi.org/10.1016/j.cognition.2010.11.006>.
- Mounty, J. L., Pucci, C. T., & Harmon, K. C. (2014). How deaf American Sign Language/English bilingual children become proficient readers: an emic perspective. *Journal of Deaf Studies and Deaf Education*, 19(3), 333–346. <https://doi.org/10.1093/deafed/ent050>.
- Niparko, J. K., Tobey, E. A., Thal, D. J., Eisenberg, L. S., Wang, N.-Y., Quittner, A. L., et al. (2010). Spoken language development in children following cochlear implantation. *JAMA: Journal of the American Medical Association*, 303(15), 1498–1506. <https://doi.org/10.1001/jama.2010.451>.
- Patterson, J., & Pearson, B. Z. (2004). Bilingual lexical development: influences, contexts and processes. In B. A. Goldstein (Ed.), *Bilingual language development and disorders in Spanish-English speakers* (pp. 77–104). Baltimore: Brookes Publishing.
- Pearson, B. Z., Fernández, S. C., & Oller, D. K. (1993). Lexical development in bilingual children and toddlers: comparison to monolingual norms. *Language Learning*, 43(1), 93–120.
- Petitto, L., Katerelos, M., Levy, B. G., Gauna, K., Tétrault, K., & Ferraro, V. (2001). Bilingual signed and spoken language acquisition from birth: Implications for the mechanisms

- underlying early bilingual language acquisition. *Journal of Child Language*, 28(2), 453–496.
- Pick, L. (2013). Health care disparities in the deaf community: individuals with hearing loss experience health care inequities. *American Psychological Association Spotlight on Disability Newsletter*. <https://www.apa.org/pi/disability/resources/publications/newsletter/2013/11/deaf-community>.
- Pisoni, D. B., Kronenberger, W. G., Roman, A. S., & Geers, A. E. (2011). Measures of digit span and verbal rehearsal speed in deaf children after more than 10 years of cochlear implantation. *Ear and Hearing*, 32(1), 60S–74S. <https://doi.org/10.1097/AUD.0b013e3181ffd58e>.
- Putnam, R. D. (2000). *Bowling alone: the collapse and revival of American community*. New York: Simon & Schuster.
- Quandt, L. C., & Kubicek, E. (2018). Sensorimotor characteristics of sign translations modulate EEG when deaf signers read English. *Brain and Language*, 187, 9–17. <https://doi.org/10.1016/j.bandl.2018.10.001>.
- Roberts, M. H. (1939). The problem of the hybrid language. *The Journal of English and Germanic Philology*, 38, 23–41.
- Schachter, A., Kimbro, R. T., & Gorman, B. K. (2012). Language proficiency and health status: are bilingual immigrants healthier? *Journal of Health and Social Behavior*, 53(1), 124–145. <https://doi.org/10.1177/0022146511420570>.
- Smith, S. R., Kushalnagar, P., & Hauser, P. C. (2015). Deaf adolescents' learning of cardiovascular health information: sources and access challenges. *The Journal of Deaf Studies and Deaf Education*, 20(4), 408–418. <https://doi.org/10.1093/deafed/env021>.
- Steinberg, A. G., Barnett, S., Meador, H. E., Wiggins, E. A., & Zazove, P. (2006). Health care system accessibility. Experiences and perceptions of deaf people. *Journal of General Internal Medicine*, 21(3), 260–266. <https://doi.org/10.1111/j.1525-1497.2006.00340.x>.
- Thierry, G., & Wu, Y. J. (2007). Brain potentials reveal unconscious translation during foreign language comprehension. *Proceeding of National Academy of Sciences*, 104, 12530–12535.
- Thordardottir, E. (2015). The relationship between bilingual exposure and morphosyntactic development. *International Journal of Speech-Language Pathology*, 17(2), 97–114. <https://doi.org/10.3109/17549507.2014.923509>.
- Watkins, S., Pittman, P., & Walden, B. (1998). The deaf mentor experimental project for young children who are deaf and their families. *American Annals of the Deaf*, 143(1), 29–34.
- Whalen, D. H., Moss, M., & Baldwin, D. (2016). Healing through language: Positive physical health effects of indigenous language use [version 1; peer review: 2 approved with reservations]. *F1000 Research*, 5, 852. <https://doi.org/10.12688/f1000research.8656.1>.
- Wilkens, C. P., & Hehir, T. P. (2008). Deaf education and bridging social capital: a theoretical approach. *American Annals of the Deaf*, 153, 275–284. <https://doi.org/10.1353/aad.0.0050>.
- Wilkinson, E., Villwock, A., Amador, B., Piñar, P. & Morford, J. P. (2018). *Lexical processing in emergent deaf bilinguals*. Paper presented at the 3rd International Conference on Sign Language Acquisition, Istanbul, Turkey.
- Wu, Y. J., & Thierry, G. (2010). Chinese-English bilinguals reading English hear Chinese. *Journal of Neuroscience*, 30(22), 7646–7651. <https://doi.org/10.1523/JNEUROSCI.1602-10.2010>.
- Yoshinaga-Itano, C. (2006). Early identification, communication modality, and the development of speech and spoken language skills: patterns and considerations. In P. E. Spencer & M. Marschark (Eds.), *Advances in the spoken language development of deaf and hard-of-hearing children* (pp. 298–327). New York: Oxford University.
- Yoshinaga-Itano, C., Sedey, A. L., Wiggin, M., & Chung, W. (2017). Early hearing detection and vocabulary of children with hearing loss. *Pediatrics*, 140(2), e20162964. <https://doi.org/10.1542/peds.2016-2964>.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.