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What you don't know can hurt you: The risk of language deprivation by impairing sign language development in deaf children

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Abstract

A long-standing belief is that sign language interferes with spoken language development in deaf children. Brain changes associated with language deprivation may be misrepresented as sign language interfering with spoken language outcomes of cochlear implants, which leads to professionals and organizations advocating for preventing sign language exposure before implantation and spreading misinformation. The existence of one – time-sensitive – language acquisition window means a strong possibility of permanent brain changes when spoken language is not fully accessible to the deaf child and sign language exposure is delayed, as is often standard practice. There is no empirical evidence for the harm of sign language exposure but there is some evidence for its benefits, and there is growing evidence that lack of language access has negative implications. This includes cognitive delays, mental health difficulties, lower quality of life, higher trauma, and limited health literacy. Claims of cochlear implant- and spoken language-only approaches being more effective than sign language-inclusive approaches are not empirically supported. Cochlear implants are an unreliable standalone first-language intervention for deaf children. Priorities of deaf child development should focus on healthy growth of all developmental domains through a *fully-accessible* first language foundation such as sign language, rather than auditory deprivation and speech skills.

Keywords

hearing loss; sign language; language deprivation; deaf child development; cochlear implant

For hundreds of years, language philosophies and education of deaf children have been mired in an "either-or" dilemma between sign language-inclusive and spoken language-only approaches. It has been described as a "highly polarized conflict" with widespread misinformation about what is the best approach (Humphries et al., 2012b), such as the belief that sign language acquisition interferes with spoken language acquisition. In fact, bilinguals are associated with better cognitive outcomes when compared with monolinguals (Adesope, Lavin, Thompson, & Ungerleider, 2010), especially at earlier ages of active bilingualism (Luk, De Sa, & Bialystok, 2011). This belief of sign language-interference has endured despite a long-standing lack of empirical evidence that spoken language-only approaches are more effective (Henner, Caldwell-Harris, Novogrodsky, & Hoffmeister, 2016; Humphries et al., 2016).

In a recent systematic review of sign language and spoken language interventions compared to spoken language-only interventions, the authors concluded "…very limited, and hence, insufficient evidence exists to determine whether adding sign language to spoken language is more effective than spoken language intervention alone to foster [spoken] language acquisition" (Fitzpatrick et al., 2016, p. 14). Such reviews are fundamentally flawed in failing to distinguish natural sign languages from artificial communication systems, which would not enable bilingualism or language transfer (e.g., sign-supported speech or signing exact English) (M. L. Hall, Caselli, & Hall, 2017). Additionally, the authors approach the system review as if the "burden of evidence" is in only one direction; however, if the evidence is supposedly insufficient in one direction – ipso facto, it is insufficient in the other direction and there is insufficient evidence of spoken language-only approaches being more effective.

Medical and educational advice is frequently rooted in a framework of viewing deaf children as "defective hearing people" (Bailes, Erting, Erting, & Thumann-Prezioso, 2009), an approach that becomes a self-fulfilling prophecy. In fact, medical school education does not address language development for deaf and hard-of-hearing children (Humphries, Kushalnagar, Mathur, Napoli, Padden, Pollard, et al., 2014), which can lead to flawed medical advice. Additionally, parents often rely on community sources (e.g., teachers, ministers, other community members) that are not knowledgeable about language, cognitive, and brain development of deaf children (Humphries, Kushalnagar, Mathur, Napoli, Padden, Rathmann, et al., 2014).

Some hearing loss professionals and organizations advocate for preventing sign language exposure through the Listening and Spoken Language approach, what is historically known as oralism (Sugar, 2016; Sugar & Goldberg, 2015). This opposition to sign language is not based on empirical evidence supporting the harm of sign language exposure, thus perpetuating misinformation such as the sign language acquisition window being longer than the spoken language window. Rather, this systematic exclusion of sign language in deaf child development is described as being rooted in bias and prejudice (Humphries et al., in press). As a result, parents can become misinformed about the "potential and *probable* implications" of not exposing their deaf child to a fully accessible visual language such as sign language (Bailes et al., 2009, p. 449). If spoken language is not fully accessible to the deaf child and sign language exposure is delayed, then there is a strong possibility of permanent brain changes.

During the critical period of language acquisition (approximately the first five years of development), there is a high degree of brain plasticity. Language delays affect development of neuro-linguistic structures in the brain, especially those related to developing grammar and second language acquisition (Skotara, Salden, Kugow, Hanel-Faulhaber, & Roder, 2012), and appear to decrease grey matter in certain parts of the brain (Penicaud et al., 2013). Altogether, a fundamental and irreversible biological impact – on the brain and on healthy development – appears to occur when an accessible language is not provided by a certain *early* time period in brain development.

A brain imaging study of deaf adults who could not functionally communicate in spoken English and used American Sign Language (ASL) for 30+ years, but were exposed to ASL at different times (birth to 3 years, 4 to 7 years, and 8 to 14 years), found an "age of acquisition" effect on their ability to understand grammar (Mayberry, Chen, Witcher, & Klein, 2011). More specifically, later exposure demonstrated more activation in posterior *visual* brain regions, and less in anterior *language* brain regions while watching ASL sentences; the reverse was true for those who were exposed to ASL earlier. Later exposure meant that linguistic information was more likely to be processed as visual information, a far less efficient means of language processing. Even after decades of language use, later exposure to ASL meant less processing in language brain regions – highlighting that the sign language acquisition window is not longer than spoken language. Generally, delayed acquisition leads to less specialization of language in the brain (Leybaert & D'Hondt, 2003).

Parents have high expectations for successful outcomes of the cochlear implant (a neuro-prosthesis that bypasses the ear and provides sound stimulation to the brain); many are convinced that it is the only option for their deaf child to acquire language (Humphries et al., 2012; Humphries, Kushalnagar, Mathur, Napoli, Padden, Rathmann, et al., 2014; Hyde, Punch, & Komesaroff, 2010). Receiving a cochlear implant, however, between one and two years of age does not guarantee normal spoken language skills five years after implantation: non-signing implanted children can display significant language deficits relative to their hearing peers, including lower vocabulary knowledge and inconsistent speech production/perception (L. S. Davidson, Geers, Blamey, Tobey, & Brenner, 2011; Duchesne, Sutton, & Bergeron, 2009; Lund, 2015; Tobey, Geers, Sundarrajan, & Shin, 2011). Indeed, the cochlear implant has been described as being able to "provide an advantage for spoken language development, [but does not] assure development of spoken language in the normal range for all children by school age…" (Tobey et al., 2013, p. 10).

In contrast, a study of implanted children – who sign from birth – suggest that they can demonstrate comparable scores on standardized language testing (including speech skills) to their hearing peers (K. Davidson, Lillo-Martin, & Chen-Pichler, 2013). The implanted signing children's scores were also better than results shown in previous studies of implanted children who did not sign from birth. The authors concluded that "without a period of language deprivation before the implantation of the cochlear implant, children with cochlear implants can develop spoken language skills appropriate for [their age]… sign language input does no harm to a deaf child's spoken language development after h/she receives an implant" (p. 247). Similar results were seen in a group comparison of 14 signing and non-signing implanted children; the signing-implanted children outperformed the non-signing children on three measures of spoken language (Hassanzadeh, 2012). More recently, a study of general intelligence in signing and non-signing implanted deaf children found sign language to significantly benefit cognitive outcomes, leading the authors to suggest that "the use of sign language before cochlear implants is recommended" (Amraei, Amirsalari, & Ajallouiyan, 2017).

Language deprivation, through the exclusion of a fully accessible visual language such as sign language, appears to be a more likely cause of poor language outcomes in deaf people. In the case of the cochlear implant, for example, learning how to hear *and* learning a spoken

language simultaneously is considerably more burdensome than already having a growing language foundation that can be used to help cochlear implant skill development. The common recommendation of using sign language as a "last resort," only after noticeable failure to develop speech skills, creates the possibility for language deprivation to occur given that there is only *one* time-sensitive language acquisition window regardless of visual or auditory modalities.

There does not appear to be any evidence that language cannot be learned via multiple modalities or that using sign language impairs spoken language development, but there is strong, and growing, evidence that lack of language access can cause negative development (Lederberg, Schick, & Spencer, 2013). "Evidence from deaf people who have failed to develop spoken language in an oral environment suggests that when sign language is learnt later in life, they will never display the typical neural circuitry of natively learnt languages" (Lyness, Woll, Campbell, & Cardin, 2013, p. 2628).

Language deprivation can cause cognitive delays and mental health difficulties across the lifespan. Mental health clinicians often see language deprivation and language dysfluency being a common "symptom" in deaf individuals who seek treatment, and are subsequently admitted to inpatient hospitals (Black & Glickman, 2006). For some of these deaf patients, language deprivation is so severe that it may be its own mental health disorder – a "language deprivation syndrome" (Glickman, 2007, 2009; Gulati, 2003, 2014; W. C. Hall, Levin, & Anderson, in press; Humphries et al., 2016b).

Prevalence of mental health issues appears to be proportionally elevated in the deaf population, along with a lower quality of life (Fellinger et al., 2005; Fellinger, Holzinger, & Pollard, 2012). Higher rates of interpersonal trauma are also a concern as are distinct traumas unique to being a deaf child raised in a hearing world (Anderson & Leigh, 2011; Anderson, Wolf Craig, Hall, & Ziedonis, 2016). In a study of mental health status of implanted deaf children and their hearing peers, teacher ratings of peer problems and general issues were elevated for implanted students (Huber & Kipman, 2011). Additionally, one study of deaf college students demonstrated higher rates of child maltreatment, lifetime trauma, and post-traumatic stress symptoms compared to their hearing peers (Schenkel et al., 2014).

In the studies described above with suggested protective factors, all were connected to language. This included deaf community identification, socialization with deaf peers, and early access to communication with family and peers. Parental communication appears to be a more significant predictor than parental involvement in education for positive language and academic development in deaf children (Calderon, 2000). The implication of these protective factors is that language deprivation may be partially responsible for health disparities experienced by deaf people – which is a growing concern in the field of health literacy and knowledge connected with language skills (Barnett, McKee, Smith, & Pearson, 2011; McKee, Barnett, Block, & Pearson, 2011; McKee & Paasche-Orlow, 2012; McKee et al., 2015; Smith, Kushalnagar, & Hauser, 2015).

Claims that spoken language-only approaches are more effective are not rooted in an objective research foundation, and may interfere with healthy development of deaf children. Parents and professionals should be aware that the cochlear implant is currently unreliable as a standalone first-language intervention for the deaf child (Humphries et al., 2012b; Kral, Kronenberger, Pisoni, & O'Donoghue, 2016). The benefits of early language exposure are not disputed and when the choice is between more (sign language-inclusive) or less (spoken language-only) language exposure, the standards of clinical practice should demand overwhelming evidence of the gains made by less language exposure rather than the current demand for evidence supporting more language exposure.

The lifelong consequences of language deprivation are too far-reaching, from early childhood to adulthood, to limit a deaf child's time-sensitive language acquisition opportunities. Rather than focusing on auditory deprivation and speech skills, developmental approaches for deaf children should prioritize healthy, expected development of all developmental domains (e.g., cognitive, academic, socio-emotional) that comes with the guaranteed full acquisition of a *fully accessible* first-language language foundation such as sign language.

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