Sign Language and Spoken Language Development in Normal Hearing Children, Children with Mild to Moderate Hearing Impairments, and Autism Spectrum Disorder: A Review of the Literature

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ABSTRACT:

The influence of sign language on spoken language development has been extensively studied in typically developing children for many years. However, less is known about the influence of sign language on spoken language development for those with a mild hearing loss, or those with autism spectrum disorder. The goal of this thesis is to review the literature regarding the influence of sign language on spoken language development for those with mild hearing impairments, and those with autism spectrum disorder, in addition to those with normal hearing. Consistent with previous work, our review suggests that the presence of a signed language system neither helps, nor impairs spoken language development for those with normal hearing. However, exposure to sign language in addition to spoken language may improve verbal communication in children with autism spectrum disorder. There is insufficient data to determine the influence of sign language exposure on spoken language development for those with a mild to moderate hearing impairment.

Introduction:

Across cultures and languages, the ability to communicate is consistently one of the earliest and most essential goals that will be set for a child. However, not all parents are equipped with the knowledge of how to encourage and support language development for their children. In addition, for parents with a hearing-impaired child, or a child who shows a language delay for no apparent reason, parents may expect to by unsure of how to proceed in supporting language development for their child. In the absence of spoken language, parents may begin to wonder whether they should supplement spoken language with sign language. Some parents believe that teaching their child sign language in addition to a spoken language will delay their

child's spoken language development. Evidence of such beliefs can be found through self-published articles and blogs postings, which are becoming more prevalent through the internet (Heiselt, 2008). The central goal of this paper is to examine whether supplementing spoken language with sign language is associated with improved, delayed, or no change in language development for normal hearing children, and those with mild hearing loss or autism spectrum disorder.

In normal hearing children, the sense of hearing develops around 18 weeks' gestation (Hepper & Shahidullah, 1994). Most infants respond to their own name by 5 months, and by 6 months, they respond to "mommy or daddy." Babbling also begins around 5 months for spoken language (Boggs, 2008). Normally developing children say their first word and can respond to requests by one year of age. By two years of age children typically have two-word utterances. By three years children can use the k, g, f, t, d, and n sounds. By 4 years they can answer wh-questions and talk about activities. By 5 years, children use adjectives to describe things, can tell stories, and communicate easily.

Children who learn sign from birth typically have more rapid acquisition of first sign than spoken words. In addition to signing their first word before age one, many develop new signs more quickly than spoken children develop new spoken words (Bonvillian, Orlansky, & Novack, 1983). For example, children who sign usually sign their first word around 8 months of age and acquire up to 10 or more signs by 12 months of age (Boggs, 2008), while children who use only spoken language generally will not produce their first word until age 12 months.

One study found that children with mild-moderate hearing loss appear to develop spoken language in a manner similar to those with normal hearing, but tend to have expressive poorer expressive vocabulary (Halliday, Tuomainen, & Rosen, 2017). Others have found that mild-

moderate hearing loss does leads to impaired language development in some children, but not others.

In children with ASD, language benchmarks are more difficult to define. Since autism is a spectrum, some children may acquire spoken language with few deficits while others may be nonverbal into adulthood. There are now language benchmarks to determine when a child with ASD meets each early childhood language benchmarks; preverbal communication, first words, word combinations, sentences, and complex language ("Language Benchmarks in Children with Autism Spectrum Disorder (ASD)," 2015). Those with ASD typically display a lack of nonverbal communication, a limited ability to interact with others due to self-absorption, poor word understanding, echolaic (repetitive) speech ("Autism Spectrum Disorder," 2015). Children with ASD can have all, some, or none of these language impairments, and will acquire language at different rates.

OBJECTIVE:

The intent of this study is to review available literature regarding the effect of signed language on spoken language development in typically developing children, those with ASD, and children with a mild-moderate hearing loss. This document is intended to inform both parents and Speech Language Pathologist's (SLP), who work with language delayed children. This paper will determine the influence of a signed language system on the development of a spoken language in children from birth to age five.

METHODS:

The library of Appalachian State University was the source for all materials. Articles not available through the Appalachian State University library were not included in this review. APPsearch was the main database for finding articles, which includes a comprehensive search on Pubmed, Web of Science, PsychINFO, CINAHL Complete, and Medline. Google Scholar was assessed separately. Relevant papers that were initially cited from articles appearing in our search were reviewed as well. The terms 'autism', 'ASD', 'sign language', 'ASL', 'American Sign Language', 'baby sign', 'total communication', 'hearing loss', 'mild-moderate hearing loss', 'normal development', and 'normal hearing' were used in the criteria. The terms 'cochlear implant', 'cochlear', 'deaf' were excluded when searching for children with a hearing loss. Children who learned sign language past the age of 5 were excluded from the study unless they were included in a systematic review.

Analysis of Children with Normal Hearing

Study	Participants	Age Range	Exposed to Sign When?	Type Sign Language	Improved	Delayed	No-change	Other Outcomes
Bonvillian, J. D., Orlansky, M. D., & Novack, L. L. (1983)	10 (plus one with hearing loss)	under 18 mo.	birth	American Sign Language	**X**			first sign at 8.5 mo., 10th sign at 13.2 mo., and first combo at 17 mo.
Johnston, J. C., Durieux-Smith, A., & Bloom, K. (2005)	17 studies	<36 mo.	varies	symbolic gestures			**X**	(systematic review)
Jones, M. L., & Quigley, S. P. (1979)	2	11 mo -3 yrs 3-5 yrs	birth	American Sign Language			**X**	The two languages developed in parallel fashion in the two children, and the two systems did not interfere with each other
Kirk Elizabeth, Howlett Neil, Pine Karen J., & Fletcher Ben (C). (2012)	40	8-20 mo	8 mo	symbolic gestures			**X**	mothers in the gesture training conditions were more responsive to their infants' nonverbal cues and encouraged more independent action by their infant.
Fitzpatrick, E. M., Thibert, J., Grandpierre, V., & Johnston, J. C. (2014).	10 studies	<36 months	<36 mo	symbolic gestures			**X**	(systematic review) no evidence was identified to suggest that using baby sign interferes with typical child development.

RESULTS/DISCUSSION:

Normal Hearing Children with Deaf Parents

A study by Bonvillian et al., (1983) followed 11 children of Deaf parents across 16 months. On average, the children produced their first sign at 8.5 months, their tenth sign at 13.2 months, and their first sign combination at 17 months, while children who only used spoken language usually met these milestones 2-3 months later. In addition to communicating earlier, those who learned sign continued to achieve subsequent motor milestones and showed continuing increases in their sign language lexicon. This study shows that normally developing children who are exposed to sign language are not delayed with spoken language and may even be able to communicate with signs prior to when most children communicate with words. Research has proven that children who are exposed to sign in infancy have no more delays in spoken language than those who are only exposed to English (Jones & Quigley, 1979). Jones and Quigley (1979) followed two hearing children between the ages of 3 and 5 years old who had Deaf parents. They found that the children had the correct spoken question formation and sign question formation. The two languages developed together, and the children were not delayed linguistically. These authors noted that neither language interfered with the other in regard to question formation and the languages developed parallel to each other.

Normal Hearing Children with Normal Hearing Parents

Kirk Elizabeth, Howlett Neil, Pine Karen J., & Fletcher Ben (2012) found that similar to children with deaf parents, the use of a visual language system did not disrupt the development of spoken language. This study focused on the finding that children did not sign more words than they spoke, and they did not sign words sooner than they spoke words. It was also found

that the mothers who were placed in the gesture training conditions were more responsive to their infants' nonverbal cues.

Two systematic reviews have also been conducted, both finding that the exposure to signed language did not delay spoken language development for normal hearing children (Fitzpatrick, Thibert, Grandpierre, & Johnston, 2014; Johnston, Durieux-Smith, & Bloom, 2005). However, neither review included studies with randomized controls, so the methods are considered weak.

Children on the Autism Spectrum Scale with Sign:

Children with language delays typically see SLPs for speech therapy to help them communicate. A primary treatment goal for autistic children is to have sufficient communication to prevent communication breakdowns. Therefore, it is relevant for SLPs to be aware of whether or not the inclusion of signed language, in addition to spoken language exposure, is effective in preventing communication breakdowns.

Many studies promote the use of sign and spoken communication to children with communication disorders, including autism (Bonvillian, Nelson, & Rhyne, 1981; Carbone, Sweeney- Kerwin, Attanasio, & Kasper, 2010; Cohen, 1981). Since autism is a spectrum, some children are highly verbal while others have very little language skills. Often the path to spoken language in children with ASD is long and tedious, with spoken language being delayed or never achieved. It is uncommon for those with ASD to be exposed to signed languages when they are infants. Instead, exposure to sign language often begins when a diagnosis of ASD is made. As a result, the only available studies examining the influence of signed language on spoken language development for ASD subjects did not begin sign language until after infancy.

Bonvillian et al., (1981) conducted a systematic review examining the influence of sign language on communication abilities in nonverbal autistic children. Their results showed that children who were taught sign language demonstrated improved receptive and expressive communication in both signed and spoken modes of communication. Children who were previously unsuccessful in spoken communication were often able to communicate with signs after some exposure. A more recent study by Carbone (2010) supports these findings. Carbone (2010) followed two non-vocal ASD children. After exposure to manual signs, both children displayed an increase in vocal responses.

Based on our review, it seems clear that exposure to signed languages may help facilitate oral speech in those with ASD, or in a worst-case scenario have no effect on oral speech. Since sign is a very visual language, it can be supplemented as another form of an augmentative and alternative communication (AAC) device, one that does not require batteries or incur a monetary cost. Sign is a way to supplement communication, much like flash cards and other devices readily available to a child.

Future studies may improve upon these findings by looking at the influence of sign language on those with ASD when exposure to both spoken and signed languages begin at birth.

Hearing-Impaired Children and Sign:

The data is inconclusive for the effectiveness of sign on spoken language development in children with a mild hearing loss. Fitzpatrick et al., (2016), recently conducted a systematic review of the literature focusing on those with severe to profound hearing loss and found that too few high quality studies have been conducted to determine whether or not sign language is beneficial. Even fewer studies have been conducted examining this issue for those with a mild-

moderate hearing loss. An earlier literature review by Kumar, Young, & James, (2009) supports the lack of literature regarding this issue, by also finding that there are too few published studies to answer the current research question for those with a mild-moderate hearing loss.

LIMITATIONS:

Many of these studies are limited by the age of the children observed. Many of the studies did not look at the language development from birth, or only looked at the children for a certain amount of time. Specifically, more longitudinal studies are needed. Future studies should attempt to recruit participants before birth, allowing earlier exposure to both signed and spoken languages. Another limitation is the age at which children are diagnosed with ASD. Most children with ASD are not diagnosed until around the age of 4 ("Hunting for Autism's Earliest Clues," 2013). Sign language is often used as a therapy for ASD, instead of being used as a form of communication from birth. As a result, examining the influence of sign language on spoken language development is difficult since introduction to sign language usually begins later for those with ASD. In addition, ASD is a very broad spectrum, and variability in the severity of a subject's autism may influence the manner in which spoken and signed language develop together. Finally, while studies examining our research question in normal hearing listeners have good sample sizes, studies examining our question for those with ASD are much smaller. Also, there are essentially no studies examining this issue for those with a mild to moderate hearing loss, other than attempted systematic reviews that have concluded that we need to conduct studies answering this question for this under-researched population.

CONCLUSIONS:

Exposure to signed communication systems did not influence spoken language development for normally developing children. Sign language use has positive outcomes other than language development including preventing tantrums from poor language skills and promoting language learning earlier (Malloy, 2003). There may be an advantage to children with ASD using sign language to promote verbal language development. Although, further research on the development of sign language from birth in this population needs to be done. For those with a mild to moderate hearing loss, too few studies have been conducted in order to adequately answer our research question.

The main factor in communication is learning early, since children who are able to communicate early and easily are able to not only have benefits with language, but also in cognitive, psychological, and social development (Malloy, 2003). Further work should be conducted for these three groups of children, and others, such as those with other developmental delays. Overall, there was no evidence that sign language will create a language deficit in any of the populations.

Further Research:

In addition to further research on the topic, this study has led to many other questions that could be answered. Research could be done examining why sign language helps with spoken speech development in children with ASD. There also needs to be research done on all possible effects of learning sign and a spoken language from birth. There may not be any advantages to spoken language development, but there may be other advantages outside of language, especially in normally developing children.

Clinical Implications:

SLP's and other clinicians are encouraged to implement the use of sign alongside speech to help reduce communication breakdowns in children with ASD. Clinicians should encourage sign language use in the home, as well as in therapy for children with ASD. For those without ASD, the use of sign language does not appear to negatively impact spoken language development.

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