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The Effects of Early Sign on Spoken Language Acquisition

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Although it remains inconclusive, there is significant data suggesting that there are several benefits to teaching normally developing infants and young children sign language. Many studies have been conducted to determine the concrete effects of the use of baby sign on a child's language acquisition (Daniels, 1994; Dayanim & Namy, 2015; Doherty-Sneddon, 2008; Mueller, Sepulveda, & Rodriguez, 2014; Nelson, White, & Grewe, 2012; Okyle, 2017; Petitto, Holowka, Sergio, Levy, & Ostry, 2004). These studies collectively suggest that the benefits of sign are immense. Some of the benefits being that children experience earlier communication attempts, decreased feelings of frustration and increased self-esteem. Teaching baby sign to normally developing children has been shown to foster spoken language acquisition by reinforcing a child's communication efforts; a child is rewarded and reinforced when a parent or caregiver can correctly interpret the child's message.

Typical Spoken Language Development

In typically developing children, spoken language acquisition milestones are somewhat predictable. From birth to three months, it is expected that the child can discriminate between speech sounds and the voices of caregivers. At this point in development, language expression is primarily "reflex reactions to discomfort" such as crying, coughing, swallowing etc. (Bowen, 1998). Any spoken language that a baby attempts is typically a direct imitation of the input from their communication partners. By three months, sustained laughter in reaction to a stimulus begins to appear. Receptively, by five or six months the baby can respond to his or her name. Expressively, the baby begins babbling by attempting vowel sounds, bilabials, and some nasals. By nine months the baby has learned to say "no" in response to select requests from the caregiver and is imitating caregivers with babbling strings of different syllables. By 12 months,

the baby is responding to a variety of words and requests from the caregiver and can follow simple instructions (Owens, 2011).

During the first year of life, one of the signs of language acquisition is babbling. A typically developing baby will likely begin babbling at about 7 months and speak his or her first word at about 12 months (Petitto, Holowka, Sergio, Levy, & Ostry, 2004). Babbling is meaningless vocalizations from spoken language that have somewhat of a syllabic organization. Babbling is a result of motor flexing of the mouth and jaw muscles as the brain receives sensory input from spoken language (Petitto, Holowka, Sergio, Levy, & Ostry, 2004). The baby is essentially trying to mimic the proper articulation for sounds that he or she is hearing from communication partners.

Interestingly, studies have shown babies who are immersed in a visual language, such as American Sign Language, follow a similar pattern in terms of babble acquisition and characteristics. Many of the verbal babbling patterns are also evident in manual babbling. In a study conducted by Petitto et. al (2004) the investigators analyzed the significance of baby babbling and manual babbling. It was discovered that hand babbling involves using the same 3 necessary language components similar to that of vocal babbling: “sign-phonetic” units of a natural sign language, syllabic organization, and meaningless, syllabic vocalizations from spoken language. This led researchers to conclude that hand babbling, or early baby sign, is not only a mechanical function, but a valid form of expressive language.

During the second year of life, after mastering vocal and hand babbling, babies make incredible strides in receptive and expressive language areas. The predicted mean length utterance (MLU) for a baby between 12 and 26 months is 1.31, meaning the baby, on average, is generating two-word sentences. A baby at this stage should have about 50 to 60 words in his/her

expressive vocabulary (Brown, 1973). From 25 to 36 months, a toddler is making rapid gains in both their receptive and expressive vocabularies, adding nouns, verbs, adjectives, and adverbs. By 36 months, the predicted MLU for the child is about 2.25-2.75. Toddlers continue to produce sophisticated babble chains as they attempt more complex syllable structures and try to incorporate prepositions, pronouns, conjunctions, and auxiliary verbs (Gotzke, 2007).

At times a normally developing child may simplify the phonological and syllable structures of words in order to make them easier to produce; some may even delete difficult sounds all together, which is referred to as “deletion”. Another common error at this stage is assimilation: simplification of language production by producing two different sounds in the same manner. There are many types of assimilation but backing is the most common; “one consonant is modified toward another that is produced farther back in the oral cavity”, for instance saying “cake” instead of “take” (Owens, 2001). Given the dramatic changes in the areas of phonology, semantic and syntax, it can be said that children are making rapid gains in multiple receptive and expressive language areas. This is a critical period for language acquisition for children who use both verbal and visual models of communication.

Use of Sign in Spoken Language Development

Research has shown that teaching a baby early sign language opens the door to earlier verbal language expression.—According to Nelson, White, and Grewe (2012), use of sign with infants leads to “earlier communication of wants, thoughts, and needs, advanced speech and language development, increased IQ and cognitive skills, reduced frustration and emotional outbursts, a strengthened parent–child bond, improved literacy, and increased self-esteem and feelings of satisfaction and accomplishment”. Parents may feel compelled to use baby sign as a way to “jump-start” initial reciprocal communication with a child and promote spoken language

development. In a study conducted by Thompson (2007), 4 hearing infants between 6 and 10 months were taught a simple sign through delayed prompting and reinforcement. Results of two experiments showed that the children were able to not only spontaneously produce the sign, but also utilize it to communicate needs instead of crying. These case studies led researchers to recommend that parents teach normally developing children sign in their first two years of life. Teaching sign language to infants has the potential drastically decrease frustration due to miscommunication.

Doherty-Sneddon (2008), describes baby signing as a communication approach that teaches babies basic signs that they can use to communicate before they can effectively verbalize. Studies show that babies who can utilize manual signs have the ability to produce their first sign before they would traditionally be able to produce their first meaningful verbalization (Petitto, Holowka, Sergio, Levy, & Ostry, 2004). A study conducted with 11 hearing children of deaf parents (the parents communicated with their child in sign) found that “children produced their first recognizable sign at a mean age of just 8.5 months, with the earliest first sign at 5.5 months” (Bonvillian, Orlansky, & Novack 1983). By observing hearing children born to deaf mothers, researchers have seen that children exposed to a high frequency of signing in addition to their spoken language input acquire sign language and spoken language earlier than typically developing hearing children who are just exposed to spoken language input (Bonvillian, Orlansky, & Novack 1983). It is possible that children have the ability to associate symbolic language to manual signs earlier than they can associate symbolic language to spoken verbalizations.

Research supports the use of visual modalities such as gestures or signs as being a catalyst for early language expression. Research from Goodwyn & Acredolo (1993) showed

“when hearing parents were trained to encouraged the use of symbolic gestures (e.g., palms up for “Where is it?”), their hearing infants began to use gestures a mean of 0.69 months before their first vocal words.” Brandy (2000) conducted a case study with a woman and her 5-month-old daughter, which reinforces the idea that teaching baby sign to hearing babies will aid in their communication skills. The mother started teaching her daughter signs for words like eat, sleep, more and change. By her daughter’s first birthday, she could sign over 200 words spontaneously. The mother describes her daughter’s vocabulary as extensive. Sign, helped to eliminate guessing and prompt the caregiver as to what the child was trying communicate. In general, several researchers, academics and clinicians generally agree that children can communicate with their hands much sooner than they can create verbalizations (Daniels, 2000) and this may support increased opportunities for communication.

Children from birth to age three experience rapid changes in neural plasticity. These changes are the catalyst for a critical period of language acquisition. “During this critical period the increase in synaptic density occurs earlier and more rapidly in the occipital cortex than in the auditory; therefore, the [infant’s] brain is primed for visual input” (Humphries et al., 2016). Sign language is direct visual input to the occipital cortex. Therefore, parents around the world are using baby sign to supplement communication in their homes due to the claimed benefits. A study by Okyle (2017) reinforced many of the benefits to using early sign that Nelson et.al. had reported. These studies showed that teaching a young child gestures improved a children’s preverbal communication, boosted their social literacy confidence, improved hand eye coordination, assisted with emotion expression, and reduced feelings of frustration. Essentially, even if sign language does not accelerate a child’s spoken language acquisition by a considerable time, it may benefit other areas that significantly improve the quality of communication.

Methodological Issues in Baby Sign

Research shows there are several benefits to teaching infants baby sign, but less research has been conducted on the benefits of specific teaching methods. In a study conducted by Marilyn Daniels (1994), teachers in a prekindergarten classroom used ASL signs for terms, the alphabet, requests, and commands concurrently with spoken English during daily instruction. The teachers naturally and repetitively introduced the sign to the students. Then, a Peabody Picture Vocabulary Test was used to evaluate the receptive vocabulary of the students. Scores from the classes with ASL instruction were compared to the scores of students who received no ASL instruction. The students in the prekindergarten classes who received sign instruction performed significantly higher on the Peabody Picture Vocabulary Test than students in prekindergarten classes that did not receive sign instruction. These results indicated that simultaneously presenting words visually, kinesthetically, and orally enhanced a child's vocabulary development (Daniels, 1994).

In a more recent study conducted in 2014, researchers wanted to evaluate the “impact of parental training of baby sign on the cognitive, communicative, social, adaptive behavior, and physical development of their children” (Mueller, Sepulveda, & Rodriguez, 2014). This study utilized a 5 week method of sign instruction with both the parents and children. A different vocabulary theme was introduced each week: “week 1 – family members and greetings, week 2 – food items and related verbs, week 3 – toys and animals, week 4 – emotions and routines, and week 5 – miscellaneous”. One week prior to instruction, pretesting was conducted to reveal the baseline raw score on the Developmental Assessment of Young Children (DAYC) language battery. Six weeks after the 5-week long Baby Sign workshop concluded, a post-testing occurred to compare to the pre-test baseline results. A Wilcoxon signed-rank test “showed that there was a

significant difference between pre- and post-test scores across all areas of child development”, demonstrating “a significant improvement in physical development...fine motor development...social development ...communication development...cognitive development...and adaptive behavior development...” (Mueller, Sepulveda, & Rodriguez, 2014). Although still in its early stages of research, results from these studies show that teaching baby sign through a categorically organized method with parental reinforcement may have a positive impact on all areas of a child’s development.

Given advances in technology, other studies have focused on use of screen-time methods to support instruction of baby-sign to toddlers. In 2015, a study was conducted to investigate the efficacy of using instructional videos to teach baby sign, and if parental reinforcement of these signs had any additional effect. Parents were split up into four categories based on instructional video sign exposure; video viewing alone, video co-viewing with a parent, a parent instruction with a picture book, and no-sign-exposure/control. Parents were instructed to expose infants to 18 signs from the television training for 15-20 minutes each session, 4 days for 3 weeks. Parents were asked to keep a detailed checklist of the 18 terms to see if the infant comprehended or produced the verbal labels that corresponded to the signs. “Forced-choice, elicited production, and parent report measures indicate learning across all three exposure conditions...There were no differences between experimental and control conditions in the acquisition of corresponding verbal labels.” An ANOVA was used to analyze the results. Interestingly, regardless of the category of input method the infants were exposed to, they were all able to learn the signs after the 3 weeks (Dayanim & Namy, 2015). Findings from this study show that sign instruction through screen-time methods is effective with or without parental reinforcement. These findings

suggest that regardless of the method of input, if a baby is exposed to sign language the child is likely to use it as a form of communication.

Despite the documented benefits of using multi-modal communication (verbal language and sign language), there appears to still be hesitation from parents to use different modes of communication with a child developing spoken language. There are misconceptions regarding the use of using simultaneous communication modalities with children who are experiencing a critical period for language acquisition. Many caregivers believe if you provide several modalities (verbal speech, sign, gestures) simultaneously, that it will have negative effects on the child's spoken language acquisition. However, several studies have shown that the use of multiple modalities actually enhances language development in children (Doherty-Sneddon, 2008; Nelson, White, & Grewe, 2012; Okyle, 2017; (Petitto, Holowka, Sergio, Levy, & Ostry, 2004).

Although a drastic comparison, understanding parental concerns regarding the use of baby sign can be better understood through analyzing literature on the effect of bilingual input on developing children. Research on bilingualism published by Hoff and Core (2015) reveals nine conclusions that counter common myths about exposing a baby to two languages at once. The first research-based conclusion is that “dual language input does not confuse children; children can learn two languages at the same time” (Hoff & Core, 2015). Children who are absorbing two languages at the same time are able to cognitively separate and store each language, while also using one to reinforce the other. When applied to teaching a child baby sign language, this conclusion can reaffirm parents that their child will not become confused or suffer verbal language delay from being exposed to baby sign. Another major conclusion from Hoff and Core's research states that “it is not necessary for the two languages to be kept separate in

children's experience in order for children to acquire two languages without confusion".

Essentially, when applied to sign language, this means that the infant will not be adversely affected by only one parent using baby sign to communicate with the child, instead of both parents. Parents of normally developing children might be hesitant to incorporate sign language into their child's language learning out of fear that their sign communication will be inferior to their partner's or vice versa.

Use of Sign with Children with Language Impairment

Using visual modalities to increase verbal output has been an idea that educators have toyed with for many decades when working with impaired populations. In a study conducted by Larson (1971), clinicians experimented with what they called a "simultaneous sensory approach... auditory stimulation for oral language as well as the visual stimulation for the manual language" (Larson, 1971). Following this approach, a teacher would say the word baby, present a picture of a baby, and use her hands to gesture a sign (cradling a baby) to illustrate this idea. Clinicians at the Center "hypothesized that some children will be motivated to use body gestures to express ideas" (Larson, 1971). The clinicians stressed the importance of using a concrete object as a visual representation to accompany the word presented. The hope was that the children felt empowered by this ability to successfully communicate through gestures and that they would attempt to verbalize. Findings from this study demonstrated the importance of signing and speaking at the same time and using facial expressions for sensory clues. Additionally, clinicians noted that children were most successful when signing was consistent and when a substantial receptive vocabulary was built before expression were expected. Overall, this study demonstrated that children best develop language (either solely sign or sign *and* verbal) when they are exposed to it via multiple mediums simultaneously: a picture of the target

word, a picture of how the target word is spelled, a verbalization of target word, and a sign for the target word.

Nearly four decades later, Leech and Cress (2011) contributed research that expanded on the Larson's theory of a simultaneous sensory approach. Leech and Cress explored how augmentative and alternative communication (AAC) could be "a viable option to give late-talking children (children who do not produce a minimum of 50 words and use some word combinations by the age of 2 years) a means of communicating without directly focusing on speech deficits" (Leech & Cress, 2011). Researchers wanted to use AAC intervention in order to lessen expressive language demands, "bypassing motor and cognitive demands of speech productions and focusing on building communication and language skills" (Ronski & Sevcik, 1996). Specifically, AAC intervention encourages modeling through play schemes so that the child is interested and engaged. There is a general assumption that providing AAC methods to a late talker will decrease his or her attempts to verbalize. This is a false assumption; "children with expressive difficulties who use AAC maintain or increase their use of speech during AAC interactions" (Ball et. Al, 2005).

Leech and Cress explored how effectively a child will produce target words (age-based, high frequency words with phonology that matches words that are familiar to the child) depending on the type of AAC intervention: picture board treatment or sign treatment. The child participated in structured play with toys that the experimenters preselected to create specific contexts for the tasks. The play sessions were structured to "a) systematically encourage [child] to use picture symbols and signs to communicate, and b) model speech associated with those symbols and signs to indirectly facilitate increased speech output" (Leech & Cress, 2011). During play, the experimenter would introduce a toy from the specific play scheme and prompt

the child to produce the symbol or sign for the target word. If after 10 seconds the child was unsuccessful, the experimenter would rely on the following least-to-most hierarchy of cueing: “pause with an expectant look, verbal prompt Show me X, verbal prompt Show me X with model of sign/symbol, and hand-overhand modeling”, being careful to never deliberately prompt the child to produce the symbol or sign (Leech & Cress, 2011). Intervention continued until the child produced six signs/symbols or spoken productions out of eight opportunities (expectant pauses or verbal prompts from experimenter); this helped to determine mathematically whether the child learned the symbols, signs, and/or spoken target words. Results from this study showed that “prompting through routines and play structure combined with access to AAC was the most effective means for [the child] to produce target words” (Leech & Cress, 2011). It was shown that intervention modality (symbols vs signs) did not affect outcome. However, even if the child did not use the symbols or signs, it is arguable that their presence alone facilitated the child’s willingness to make communication attempts. Overall, offering AAC methods facilitates speech acquisitions and output.

Conclusion

Research on using baby sign as an intervention method for children with delayed language acquisition is limited. Other studies that have investigated the use of sign as an Alternative and Augmentative Communication for children with language impairment suggest that AAC should be further researched due to its ability to facilitate spoken language acquisition. Children with language impairments or with autism are generally able to learn to communicate basic wants and needs after receiving modified sign intervention, regardless of the intervention method. By giving children modified tools to communicate (sign language) it is clear that their quality of life will be improved. There are clear benefits to using modified baby sign language to

promote communication confidence and lessen frustration in normally developing children.

While it has not been proven whether sign language accelerates spoken language acquisition in normally developing children, it can be shown that it accelerates communication ability by providing an alternative method of communication since the child is primed to visual input at this time in their development. By supplementing auditory input with visual input (modified signs) when teaching babies and toddlers the fundamentals of communication we have the possibility to improve all areas of communication and promote positive experiences for both children and caregivers.

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