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Benefits of Baby Sign on Cognitive Development in Infants

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BENEFITS OF BABY SIGN ON COGNITIVE
DEVELOPMENT IN INFANTS

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by

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THESIS

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Abstract

Research in the area of baby sign language has increased dramatically over the past several years, however there is still a lack of research regarding baby signs effects on typical infant development, specifically in the area of cognition. The hypothesis of this study was that instruction of baby sign would be correlated with a significant increase in the development of cognition and language acquisition for infant participants. This study provided a five-week instructional course on baby sign for parents/caregivers to implement with their typically developing infants (n=11). The course provided instruction of baby signs, methods of implementation and encouragement to the parents/caregivers to use baby signs frequently and effectively outside of the course environment. Three development surveys and the Developmental Assessment of Young Children (DAYC) were provided as the pre-test measures for the participants' development. Post-test measures included a follow up with the DAYC as well as a survey regarding the workshop itself. Results did not support the hypothesis and no statistically significant results were found, however the study did result in interesting qualitative data. The study's limitations included the small group size, use of surveys that could have compromised data, no control group, and the confound of typically developing maturation occurrences.

Keywords: baby sign, cognitive development, and language development

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Chapter 1: Literature Review

For the past several years, questions have been raised regarding the topic of baby sign language and its effects on an infants overall development. Research completed on this topic has been approached from various perspectives regarding whether or not sign language does or does not affect language, and if so, whether or not it is beneficial. This newly surfaced research topic is beginning to develop and focus on teaching what is called “baby sign language” to children who have been diagnosed with a delay or disorder as a means of communication (Benaroya, Wesley, Ogilvie, Klien, & Meaney, 1977). Although this research is expanding, there is little to no research that states the effects of sign language on specific areas of infant developing, specifically cognition and its development. Most of the information pertinent to this topic is focused on children with developmental difficulties in language.

The area of language is closely linked to cognition and the two have a reciprocal relationship. To functionally communicate there has to be an understanding of what the concept trying to be conveyed is, and the proper way to communicate that concept. Focusing on these types of studies are helpful so that researchers have more insight to the distinguishing effects being found on the different populations. However, the results do not provide sufficient information as to the effects baby sign has on the infants overall cognitive development, particularly in infants who are typically developing. In addition, most of the research is qualitative and seems to lack clinical evidence on the effects that signing may have. It is essential to determine if these effects occur on populations who are typically developing so that future researchers and clinicians have evidence for intervention. It is also important for research to focus on the effects of baby sign on all specific areas of development in attempt to create more causal relationships. This study will focus on the instruction and implementation of baby sign language and its effects on their cognitive and linguistic development, specifically if any of the areas of development seem to develop at a significantly faster rate and if those areas of development are correlated.

1.1 Language Development in Infants

Language development is often referred to, and thought of, as the verbalizations that a child produces however it should entail communication holistically. As previously discussed, infants begin intentions to communicate long before they are able to verbalize their wants and needs. This intention is broken down into different stages; perlocutionary, illocutionary, and locutionary levels. The first level, perlocutionary, is characterized by infant's attentional interactions with different responses to different stimuli. Owens (2008) discusses how, during this stage infants use different types of crying and behaviors to communicate how they are feeling as well as what they want or need. This stage is prevalent throughout the entire first year of life, however becomes more resourceful and evident during the second half. Due to the increase in intentionality and cognitive awareness at this age, the researcher felt that six months was an appropriate age to attempt to introduce baby sign into an infant's environment and add baby sign exposure to their typical routines.

Continuing with this sequence of early communication, the illocutionary stage which typically emerges around eight to nine months, is when an infant begins to use a total communication approach where gestures, vocalizations, and/or both are used as methods of communication (Owens, 2008). Infants begin to gain better muscular control and motor development during this time frame and gestures begin to emerge more frequently. The final stage of this early communication is the locutionary stage, in which the first meaningful words are used. These first words are verbalized and only counted as first words once it is apparent that they are consistent and seem to be comprehended.

Communication intent and early communication differ greatly from verbal communication. Both involve an extremely essential aspect of language, however verbal output follows different processes and steps in its development. Since this study is concerned on language and communication, and not verbal communication per say, this will not be discussed in great detail. What is relative to the study and important to understand is that infants, from a very young age, have the need and want to communicate

however lack the tools they need to convey a meaningful message. These intentions are a precursor to typical language development and indicate a typical cognitive development as well.

It has been discussed that around 8 to 9 months is when infants begin to develop intentionality in their actions (Owens, 2008), meaning that at around this age infants begin to have purposeful actions and intentions. These intentions can be applied toward communication actions and helps support the notion that infants, though still too young to communicate verbally, can still have the intent of wanting to convey a message. Even if infants do not have enough motor control to produce a sign efficiently, by 8-9 months they typically have enough gross and fine motor skills necessary to produce an approximation of the sign. These approximations are used and praised by caregivers to help reinforce the infant's intent of communication. It is in this way that baby sign is also related to language and verbal output; when an infant is learning to speak, they use what is known as babbling, jargon, and word approximations that are reinforced with the items the infant is requesting and language models. Consequently, language begins to emerge and the same types of effects occur for baby sign as well. All types of gestures are much easier to produce than speech, which relies on anatomical structures for production of voice and articulation (Ozcaliskan & Goldin-Meadow, 2009). Since infants have to wait to communicate verbally, gestures are a simpler form of communication that they can use to attempt to communicate their intentions. They are more natural to produce and seem to develop easier than vocalizations do.

1.2 Cognitive Development in Infants

Shiple & McAfee (2009) state that cognitive development is the basis of language development. Cognitive development in infants can be broken down into stages, which were first proposed by Jean Piaget (Piaget, 1964). The first stage of cognitive development is named sensorimotor stage, which is from birth to two years of age. This stage consists of using senses and motor activities to understand concepts as well as develop those concepts through interaction with the environment (Piaget, 1964).

During this stage, behaviors are learned and imitated and infants begin to develop a more complex symbolic play. For this study's purpose, this stage will be expanded and focused upon to describe the aspects of cognitive development in the population being assessed.

The first stage of cognitive development contains six sub-stages, which encompass characteristics that a child should display during typical cognitive development; these are known as Piaget's Six Sub Stages of the Sensorimotor Stage of Cognitive Development. Sub stages one and two are not relevant to this study and its population, because of the age range (0-6 months), and therefore will not be discussed. Beginning at sub stage three, secondary circular reactions which correspond to one to four month old infants, common characteristics observed are deliberately repeated actions, object recognition, replication of actions that are in their repertoire, and adding new stimuli to current actions already obtained (Piaget, 1964). Stage four, coordination of secondary circular reactions, relative to eight to twelve month old infants, entails behaviors of intentional and purposeful behaviors, object permanence, coordination of mental patterns, realization of cause-effect of different actions and objects (Piaget, 1964). Stage five, ages twelve to eighteen months, the tertiary circular reactions stage is when infants demonstrate walking and imitates different behaviors that they observe. They also begin to become aware of object spatial relations, they are more aware of themselves being apart of the bigger environment, and they use tools for different means (Piaget, 1964). The final stage of Piaget's sensorimotor stages is not pertinent to this study's population age, however is still significant in terms of further development of the infants. Characteristics include the inventive abilities via mental combinations stage, eighteen to twenty four months, infants display characteristics of the self, creative and inventive play, early language is emerging, a decrease of imitation occurs, and they are aware of things that they did not witness exactly like the movement of furniture, and they can also begin to predict cause-effect relationships among other things (Piaget, 1964). These stages are important when discussing terms of cognitive development in infants, who cannot be given formal, sit down assessments

where they are asked direct questions. For cognitive development, observation and qualitative data is necessary and essential to determine any effects or changes.

Cognitive development entails numerous mental activities; these begin at birth and continue to develop throughout adulthood. Some of the mental activities involved in cognition are, “acquisition, organization and storage, memory, and use of knowledge” (Owens, 2008). Researchers, such as Owen (2008) believe that cognitive development precedes language development because in order to have meaningful communication exchange, one must first understand the concepts being communicated. Research of cognitive development preceding language development is limited; nevertheless, it is a notion that is followed as being a logical explanation for how humans are able to develop language. As cognition develops, an infant’s gestural communication emerges and expands. As gestural communication expands so does language, as language grows we can assume that cognitive development also continues to progress being that more information is able to be understood and more knowledge can be extracted as different situations and communicative interactions occur. The development of cognition and language has a somewhat reciprocal relationship in which the development of one helps progress the development and advancement of the other. This study focuses on the area of cognitive development since these are areas that are vital during infant growth.

Studies regarding cognitive development and baby sign have found that baby sign and gestures increase infants intelligence quotient (IQ) but did not find any results related to language growth or development. Acredolo & Goodwyn (2000) conducted a longitudinal study of children of two years of age who were encouraged to use baby sign and given the Wechsler Intelligence Scale for Children (Wechsler, 1991). When given the test at the end of the study the children in the experimental group, who had been exposed to baby sign, had scored 12 points higher than the control group. There were no studies found that incorporated results based off of the effects of baby sign on cognitive development as a whole as well as its relation to increases in language development.

Though the relationship between cognition and language, which includes gestures and baby sign, seems to be reciprocal, research has shown us that gesturing can also reduce cognitive loads when typical development has fully occurred (Ozcaliskan & Goldin-Meadow, 2010). Ozcaliskan and Goldin-Meadow (2010) also found that when producing an explanation of an action or object, it is easier for humans cognitively to produce a gesture or sign that helps clarify and explain, than it is for us to search for the wording that we need to make the same explanation. Iverson and Goldin-Meadow (2005) also support the view that gesturing helps save cognitive efforts for the speaker by decreasing demands necessary on memory. This finding can be relative to language development for children as well, for instance a child who is experiencing oral language acquisition will rely and use gestural modalities to compensate for their lack of verbal productions (Thal & Tobias, 1992). This study however is focusing on cognitive development in emerging stages of infancy and believes that during these early stages of development the use of gestures can only assist and help build upon the development in the reciprocal relationship previously discussed.

1.3 Augmentative and Alternative Communication and Baby Sign Language

Augmentative and Alternative Communication (AAC) has been defined as “an area of research, clinical and educational practice. AAC involves attempts to study and when necessary to compensate for temporary or permanent impairments, activity limitations, and participation restrictions of persons with severe disorders of speech-language production and/or comprehension, including spoken and written modes of communication” (Beukelman & Mirenda, 2005). This definition covers a large part of what augmentative and alternative communication entails, however it is not everything that AAC covers. AAC is also used for individuals who do not communicate verbally, such as the deaf, who do not have typical means of language and verbal development. AAC is also used for individuals such as children who are acquiring language, and use AAC as steps to their language development (Owens, 2008).

Essentially, AAC is an altered form of communication for individuals who cannot communicate successfully without modifications. AAC focuses on enhancing the abilities of the individual and providing extra support to help that communicator be more functional in their environment.

Research supports that AAC has positive correlations with language development. AAC has shown to help improve both expressive language skills as well as receptive language abilities (Mirenda & Iacono, 2009). With other means of communication readily available, individuals with communication deficits are able to express themselves more adequately, which in turn helps expose them to more language. This frequent exposure to language from communication partners helps benefit the individual's receptive language knowledge by provided expansions and models that they can benefit from. This pattern is relative to typical language development, in which the more a child can communicate; the more they are able to understand as well and vice versa. AAC interventions have also resulted in advancements in skills such as vocabulary growth, length of messages, phonological awareness, and reading and writing skills and did not put speech development at risk (Light & McNaughton, 2012). Studies continuously support AAC interventions for children with severe communication disorders because of their positive outcomes found in the children's interactions and language development growths.

Most commonly, AAC is used for individuals with severe communication disorders who are unable to functionally communicate due to their disorders or other secondary health diagnoses that can also cause problems with communication. Current literature based on AAC focuses on its benefits and hindrances with these types of populations. This is sensible because it is believed that there would be no need to provide an individual with a tool such as AAC, unless they have a communication disorder. Mirenda & Iacono (2009) help support the notion that AAC is typically implemented to enhance communication for individuals rather than improve their speech productions. Typically, AAC is used with individuals who have such severe communication disabilities that treatment is primarily focused on

functional communication with the device. Most professionals and individuals would not think of an AAC being used only as a support and tool to supplement verbal speech productions. What most people do not realize is that AAC involves a variety of methods and tools as a resource for individuals to use to communicate. These include aided symbols, which require external assistances such as devices with speech output and picture messages, or AAC can be unaided which includes tools such as gesturing, facial expressions and sign language (Beukelman & Mirenda, 2005).

There are scarce articles that do focus on baby sign language however the populations are delayed or disordered, rather than typically developing. Additional research currently published does not distinguish between sign language and gesturing and intertwines the two instead of keeping them as two distinct different forms of communication, which will be discussed in further detail later. Research also varied in the types of implementation of signing and gesturing to infants; some studies focused on parental training and implementation whereas others focused on therapist or teacher training. The study by Acredolo, Goodwyn & Brown (2000) used parent training as the method of implementation for gesture teaching. It was reported that “in the process of training their infants to use symbolic gestures...parents were automatically focusing special attention on language development” (Acredolo, Goodwyn & Brown, 2000) which also affected the amount of interaction they would normally have with their infants. The extra emphasis on language and language development seemed to be a positive attribute for the study, which is why the researchers of the current study decided to use a parent taught implementation method.

American Sign Language (ASL) is a complex verbal-less language with its own structure and rule governed system, made up of movements of the hands, arms and body, which are also accompanied with facial expressions used as a form of communication (National Association of the Deaf). ASL is the language used by the deaf population to communicate to one another efficiently and is considered to be a form of Augmentative and Alternative Communication (AAC). Baby sign, which was

derived from ASL, is the use of visual gestures as an early form of communication between an infant and others (Pizer, Walters, & Meier, 2007). Infants with parents who are deaf or hard of hearing, are typically taught American Sign Language as their communication method; the earliest form of it being baby sign.

Baby sign is a simplified form of ASL, where physical gestures are used to convey meaning; however the gestures are modified for an infant who is still developing physically and mentally. Baby sign follows a structured development similar to the way vocal language development occurs (Anderson, 2002). Both contain similar development patterns and also share the same sets of words that are produced first. It is often believed that communication cannot occur until an infant is around the age of one; this is a common misbelief because infants typically do not begin talking until this age. What research has shown is that infants do not begin talking until after a year due to the lack of maturity and development of their vocal tract (Capirci, Iverson, Montanari, & Volterra, 2002). This one-year delay is not necessarily needed for language development or communication practice but rather due to a lack of the ability to produce speech. This is where baby sign becomes important as a means of communication for infants to use while they still cannot verbally express what they want and need. An immature vocal tract does not necessarily mean that an infant is not cognitively ready to begin communicating. Early gesturing is a secondary source for infants to use to communicate information that they cannot express verbally (Iverson & Goldin-Meadow, 2005).

Baby sign popularity increased when research studies began to emerge that praised the effects of baby sign to reduce infant crying and possibly even create a reduction in parental stress levels (Brady, 2007). Studies indicated that this occurred because infants were able to express their wants and needs and substituted the crying for communication exchanges through sign to express wants and needs. Brady (2007) supported this notion and made the claim that implementation of baby sign, using modeling and prompting, did decrease crying and whining in a six month old typically developing infant. According to

Howlett, Kirk, and Pine (2010) however, this claim appeared to be a false benefit of teaching baby sign to infants. Their research found that teaching infants baby sign did not reduce the amount of crying from the infants nor did it reduce any levels of stress in the parents. The researchers even discovered that some of the parents had increased stress levels after the baby sign instruction was given to them. Even after these claims were falsified, research in this area continued to grow and gained attention from researchers, clinicians, and parents alike. Brady (2007) also reported that infants displayed decreased frustration levels. Capone (2004) also indicated that the use of gesture may help lower frustration levels because the infants are able to communicate their wants and needs, helping facilitate communication between infants and parents.

As research was emerging in the area of baby sign language, a vast amount of existing research was being conducted with gesturing. Gestures differ from baby sign because they are not rule-governed and they are not a meaningful element the way a baby sign is (Capirci, Iverson, Montanari, Volterra, 2002). Research related to gesturing has examined all areas of development through language, cognition and even learning abilities. Research from Goldin-Meadow (2009) found that children use gestures to help convey information that they already know but are unable to express linguistically. It also helps promote their learning throughout childhood; typically the gestures these children use are a reflection of their knowledge. While the majority of the literature focuses on gestures, it is important to consider that they are different elements of communication and can be utilized in different forms.

The trait that baby sign language shares with gesturing is that they are both types of AAC, meaning that both are used as alternative forms of communication. As previously stated, baby signs are a meaningful element paired with a gesture produced or approximated the same way each time. However when discussing gesturing it should be recognized that there are different forms of gestures that are used to convey object information (deictic gestures) and action information (iconic gestures) (Ozcaliskan & Goldin-Meadow, 2009). Deictic gestures are used to convey information specific to an

object or item, a child might point at a ball to indicate, “ball”. Iconic, or conventional, gestures are used to convey actions, such as a child reaching their arms upward toward an adult and grasping their hands upward, to indicate they want to be carried.

There are a limited amount of research studies related to the impact of gestures and baby sign on areas of development for infants who are typically developing. Research on baby sign primarily deals with young populations who are delayed or disordered, which was a deciding factor for this study’s population. Due to the need that delayed or disordered populations have for augmentative and alternative communication modalities, it is obvious that research is more abundant for those areas opposed to typically developing populations. However, for researchers to uncover the fundamental impact that baby sign or gesturing has on individuals, it should be studied in populations who are not disordered or delayed so that correlations and findings can have a more supportive foundation to make inferences from.

A common misconception is that teaching infants baby sign or other forms of communication will cause a delay in their communication or verbalizations, this has been an area long debated between different ideologies (Pizer, Walters, & Meier, 2007). All research information provided above helps support that this notion is actually false. Millar et al. (2006) conducted a review to help determine the effects that AAC had on speech production with individuals who had developmental disabilities. They found that AAC interventions did not seem to have a negative impact on the speech productions of the populations they are used with. It seems safe to assume that if there were no negative impacts for populations who had disabilities then there would be no negative impacts on typically developing populations.

The fields of Speech-Language Pathology as well as Psychology have researched the areas of gesturing and sign language in regards to early language development. It is believed and supported by many researchers that gesturing is actually a precursor to language development and is an important

stage of an infant's development which is highly supported with the notion of intentionality during communication development, when gestures begin to occur as a form of communication (Owens, 2008). Iverson and Goldin-Meadow (2005) also directly state, "that gesture both precedes and is tightly related to language development." It has also been found that between 9-12 months of age children typically begin to produce their first gestures by pointing at objects in the environment (Iverson & Goldin-Meadow, 2005). These are their first obvious signs of communicative intent and production. Gesturing is a facilitated form of alternative communication that children use that has been researched to determine if it helps increase language development. Iverson and Goldin-Meadow (2005) believe that gesturing is an easier way for children to indicate to their communication partners that they are ready for more verbal inputs during communication.

It is understood that children who are exposed to more speech input and hear a larger variety of words tend to have larger vocabularies than children who are exposed to less speech and smaller lexical items (Rowe, Ozcaliskan, & Goldin-Meadow, 2008). When children begin to use gestures, more often than not, parents or guardians are there to provide additional communication and language productions for the infant as a response. Therefore, we can assume that when children produce gestures, without realizing it, parents provide a more language rich environment for the infants and use a variety of vocabulary (Iverson, Capirci, Longobardi, & Caselli, 1999). Just like with verbal language and communication, gesture and sign development is based off of parent input. A correlation by Iverson, Capirci, Longobardi, & Caselli (1999) was found between mothers who used gesturing and the amount that they talked; the more they talked the more communication learning opportunities opposed to mothers who were less communicative. Gesturing, as well as baby sign language, has been observed to develop similarly to the development of verbal speech. Approximations are made at first with gestures, for example an infant pointing may not have the fine motor movements to extend only one finger and therefore may use their entire hand to point, but this is an approximated gesture and the communicative

intent and message can still be understood by a communication partner. This type of development is similar to that observed with verbal approximations, for instance when an infant says “wa-wa” for water (Owens, 2008).

Gesturing and sign also seem to develop similarly to language as far as the use and complexity of the communicated message. Ozcaliskan & Goldin-Meadow (2005) stated “producing meaningful words and gestures in a single combination thus appears to be a significant developmental step...that allows them to combine words with gestures several months before they take the step that enables them to combine words with other words.” Research has found that, similar to language, the development of gestures works the same way and they are used in isolation, then in a simple combination with a verbalization, and then a more complex two word utterance or two-gesture utterance. This coincides with how language develops, Owens (2008) looks at “Toddler Talk” as he calls it, in which by 18 months of age a child typically has around 50 single word utterances that they use on a regular basis. Then emerge multiword combinations, which are typically eased into post gesture-speech combinations. Also like language, the types of gesture-speech combinations that are used change over time as the child’s cognition and language expand (Owen, 2008).

Researchers have focused primarily on whether, how and why gesturing effects language development. Rowe, Ozcaliskan, and Goldin-Meadow (2008) found that the use of gestures by parents and infants was proven to show an increase in their child’s vocabularies later on in development. The study observed typically developing infants’ and their parents’ use of gestures in their home environment during play and found that children (14 months of age) and their use of gestures was a substantial predictor of vocabulary size at age 42 months. However, parental use of gestures did not provide the same kind of results for lexicon growth later. Parental gestures however, are significantly reflective of the amount of gestures that a child uses. Parents, who gesture more frequently, have children who also gesture more during communication and development (Iverson, et al., 1999).

There are even studies that support the notion that without gesturing, or with minimal gestures, an infant's language is likely to be delayed once they do begin to verbalize. Ozcaliskan and Goldin-Meadow (2009) stated "late talkers who performed poorly on gesture tasks and who made little use of gestures continued to exhibit delays in producing words one year later". The infants being discussed were already considered to be language delayed at the time that their gesture development was measured, however, as they continued to develop they did not show an increase in neither gestural communication nor verbal communication.

There has recently been a noticeable increase in baby sign language research as different views and practices have emerged on the topic. While there is research on gestures and its effects, there are not many research studies on the effectiveness of baby sign on typical infant development, specifically in the area of cognitive and language development. Current research on baby sign language and gesturing varies with the use of different age populations, different disorders and severity types, types of implementation used, modalities and effects of that AAC's use, and more. While there are numerous articles that are based off of typically developing infants and toddlers, these articles typically use qualitative data and are focused more on gestural development and use than on structured baby sign language implementation. For instance, Goodwyn, Acredolo, and Brown (2000) conducted a study on symbolic gesturing and its effects on language development, the study's participants were 11 months old and were reevaluated at 15, 19, 24, 30, and 36 months of age. They found a positive correlational relationship between the amount of symbolic gesturing used by the infants and their verbal vocabularies, the more gestures the children had the larger their verbal lexicons were. While gesturing does differ from baby sign, this study provided good research regarding the different ways that both expressive and receptive language was affected due to the gestures the participants were using. Another study supporting gesturing's support of language development, was conducted by Iverson & Goldin-Meadow (2005). This study looked at the production of gestures in relation to lexical and syntactic development

in early language acquisition. The participants used in the study ranged from 10-24 months old and it was observed that gesturing is tightly related to early language development. The study found a correlation that children could use both the gestures as well as the verbal output that they already had developed to communicate, however their gestures allowed for even earlier syntactical complexity.

There are few systematic reviews based on gestural signs, which include gestures, sign language, and baby sign language. Johnston, Durieux-Smith, and Bloom (2005) provided feedback on several studies and provided a systematic review that was specific in its search of articles on this topic. They recognized the vast differences in the research available and helped illustrate the serious lack of evidentiary research studies published on the topic. This study focused on the studies that have found great gains in the areas of language development, for instance Capone and McGregor (2004) who found that gesture use was associated with gains in both expressive and receptive language growths.

1.4 Purpose and Hypothesis

Based on information and research on baby sign and cognition, the researcher assumes that because cognition and language have a correlational relationship, that an increase in the development of one will likely cause an increase in the development of the other. Baby sign training can help infants communicate early and therefore give them more channels to information, both receptively and expressively, than if they have no means to convey messages. These outlets can be used to both communicate and receive messages and information for knowledge. As infant's knowledge expands, it's safe to assume that their cognitive processing and development will advance along with it. Therefore, the argument is that baby sign training can help create advancements in cognitive development and language development.

The purpose of the current study is to determine whether parent/caregiver implementation of baby sign would have an effect on the cognitive and linguistic development of their children. The researcher hypothesizes that there will be a significant increase in both cognitive and language development. If the infant's primary caregiver is the adult who attends the baby sign workshop, the

researcher believes this will create a greater increase in development, being that the infant would be exposed to the sign more often than those who are in daycare or taken care of by a relative unfamiliar with the signs.

Chapter 2: Methods

2.1 Design

The study used a pretest-posttest group case study design. Participants were given an assessment prior to the baby sign instruction their parents/caregivers received, the baby sign was implemented, and the infants were reassessed approximately five to seven weeks after the baby sign course ended. The total time between pre-testing and post-testing was approximately ten to twelve weeks.

2.2 Participants

The participants of the study were eleven infants between the ages of six and twenty-nine months of age, made up of five boys and six girls (four the participants made up two sets of siblings). All infants were typically developing, although two of the participants (twins) had been previously diagnosed with a language delay. When they were tested, their standard scores fell within the mean of typically developing infants their age. Each infant participated with at least one parent or guardian who voluntarily signed up to attend the instructional baby sign language classes and actively participated during the classes.

To maintain confidentiality among the infant participants and allow the researcher to create correlational relationships between results, each participant was assigned a “participant number” containing the letter P and a number between 1-11 (e.g. P1, P2, P3). Participant numbers were assigned according to their chronological age at the start of the baby sign courses, therefore Participant 1 (P1) was the youngest infant in the group at six months old, and Participant 11 (P11) was the oldest at twenty-nine months of age.

Table 2.1: *Participant number, sex, and age during assessments*

Participant	Sex	Age During Assessments (Pre-Post)
P1	Female	0:6 – 0:9
P2	Male	0:7 – 0:11
P3	Male	0:10 – 1:14
P4	Female	0:10 – 1:0
P5	Male	1:3 – 1:5
P6	Male	1:3 – 1:6
P7	Female	1:6 – 1:9
P8	Female	1:7 – 1:10
P9	Female	2:0 – 2:3
P10	Female	2:0 – 2:3
P11	Male	2:5 – 2:7

2.3 Materials

Materials used were the Developmental Assessment of Young Children (DAYC) as well as four surveys; a child interaction questionnaire, language development milestone checklist, checklist of cognitive characteristics, and finally an evaluation of the baby sign workshop (See Appendices A-D).

The Developmental Assessment of Young Children (DAYC) was used to assess the children before and after the baby sign instruction occurred. The DAYC consists of five subtests measuring cognition, communication, physical, adaptive, and social-emotional developmental behaviors. All subtests were used during the assessment to attain a general development quotient for each of the participants. However, the focus of this study was primarily on the cognitive development and communication development subtests during the discussion of results. The DAYC was selected as the assessment tool due to its specifically targeted population of infants and young children as well as the

convenience of an assessment that can assess all areas of development for children. The assessment is typically used to assess infants whom may be at risk of a developmental delay or disorder and are assessed to determine if early intervention services are necessary.

To help determine the level of exposure of baby sign that the infants were receiving at home, it was essential to identify whom the infants interact with most frequently on a daily basis. The first survey, created by the researcher, was a child interaction questionnaire to help establish this information. This vital information was used to establish the levels of baby sign exposure the infant was receiving and create associations within the results. The questionnaire also sought information regarding the infant's family; specifically whether the infant has siblings and if so, their ages. This information is useful to see whom the infant is communicating with other than caregivers and helps give insight to possible barriers of communicative development. For instance, if a participant had older siblings, that participant's language development could possibly be developing more slowly because their siblings speak for them. This informed us of the communication models the infant is receiving in their home environment.

In order to determine if any language growth was observed by the caregivers post baby sign instruction, a survey from Shipley & McAfee (2009) containing the major milestones of language development was provided before the baby sign language instruction began. The checklist included a list of major milestones that infants reach at different ages of development. Parents were asked to only mark the milestones that their infant had reached during the time of the first assessment, before the signing instruction course. This provided a level of language development to use as a baseline to compare against their language development post one-month post baby sign instruction. This information provided qualitative data for the clinician to relate to the participants DAY-C scores. Information regarding the infants communication milestones, post baby sign instruction, was taken during the

reassessment time. Parents were asked to give any examples or information of new or different communication abilities that their infants were displaying.

The checklist of cognitive characteristics, created by the researcher, was used to gain data on the infant's current cognitive development before any signing instruction. The characteristics used were taken from the sub stages of Piaget's Sensorimotor Stage of Cognitive Development (Shiple & McAfee, 2009) (See Appendix C). The checklist was used to assess the infants' cognitive development and determine what current sensorimotor stage the infants were in. This information helped support the infants' current level of function. The survey was not provided after the baby sign course because the information utilized to assess only pre-test functioning levels.

Finally, a survey focused on the evaluation of the baby sign workshop was given to determine the strengths and weaknesses of the instruction of baby sign to the caregivers. This also gave insight into the confidence and stress levels of the caregivers who attended the baby sign workshop and were implementing the signs at home. This type of information is vital to correlational relationships and can be helpful during future research studies that have similar methods.

2.4 Procedures

Before any assessments or baby sign instruction began, the parents/caregivers were provided with an informed consent form to read, discuss, and sign with researchers. Once adult participants willingly agreed to participate with their infants, they were given the three surveys to complete. After these forms were completed, one to three researchers of the current study assessed the infants in the areas of adaptive behavior, physical development, social-emotional development, communication development, and cognitive development using the DAYC. Assessments were conducted to ensure the receptive and expressive language of the infants were within typical ranges and to attain a baseline of their current functioning levels.

After all initial assessments were completed, all participants consisting of parents/caregivers, along with their infants, attended the instructional courses on baby sign language. The course was held

once a week for a two-hour session, over the course of five weeks, and broken into two sections. Section one, at the start of the session, was an instruction period where the babies were removed from the room while researchers instructed parents/caregivers on a minimum of twenty previously planned baby signs (See Appendix E). Researchers would train the parents/caregivers on how to correctly produce each sign and provide different implementation examples. Each sign was focused on individually and modeled by the researchers for the parents/caregivers to see. All parents/caregivers were then asked to actively produce the sign and practice the way they planned on implementing the sign with their infants.

Once it seemed the parents/caregivers were familiar with the baby signs, section two of the course began. The infants were brought back into the classroom for parents to practice using the signs during a variety of one-on-one activities and with the use of concrete items from the list of signs that were taught that day (e.g. cookies, toys). The types of activities conducted during the interaction period of the course varied on the lesson of the day, for instance different toys were brought in for parents to show their infants and label using their verbalizations and signs. There were also shared reading activities conducted with different books that were relative to the weeks signing lesson. Verbalizations accompanied all signs during instruction and implementation with the infant participants, and parents were instructed to verbalize each word with the sign anytime it was used. Parents were also made aware that the baby signs take time to develop and could be approximated by the infants when being used.

Each week contained a new theme providing twenty new signs for parents to implement with their infant. The weeks themes consisted of; family members and greetings, food and accompanying verbs, playtime and animals, and lastly emotions and routines. Signs were chosen based on typical first words in both verbal language and ASL (Anderson, 2002). A miscellaneous list of 74 signs was also compiled during the first four weeks of the baby sign instruction including all the signs that parents requested to know or were interested in learning. This miscellaneous list was the lesson for the fifth week of the signing course. More than 150 signs were taught over the 5-week course, however only 154 total were recorded and added into the take home binder and instructional DVD that the parents/caregivers received.

Parents/caregivers were provided with a take home binder that contained five dividers, each labeled for the different lesson categories. At the end of each class, the caregivers were given a set of handouts to place in the appropriate section for that week containing the different signs that had been taught. The handouts contained the sign name at the top, a picture demonstrating the sign, the explanation of how to produce the sign, and examples of implementation (Retnasaba, Parker, Lau, & Weaver, 2013)(See Appendix F). At the end of the five weeks, participants were also given an instructional DVD of all the signs trained over the duration of the five-week course, including the list of miscellaneous signs requested over the five weeks.

One final survey was provided at the end of the last course that asked parents about any developmental changes they had observed in their infants (See Appendix D). Parents were first asked to rate based on a 4-point scale (1 being very confident, 2 being somewhat confident, 3 being slightly confident, and 4 being not at all confident) their abilities to use the signs and their stress levels from the baby sign course and implementation. . The remaining questions were short answer and focused on the parents opinions and observations of their infants language and communication and sign usage, what they enjoyed and did not enjoy about the baby sign course, whether or not they would continue to use the baby signs after the course, and whether parents were interested in monitoring their infants development in another year. This information was attained to determine whether the signing courses created any extra stress for the caregivers implementation of signs, and to help determine what levels of growth the parents had observed within that five-week period.

Approximately five to seven weeks after the baby sign course was completed, the DAYC was re-administered to determine if there were any differences in the participants' development of all areas assessed.

Chapter 3: Results

The Developmental Assessment of Young Children (DAYC) provides an overall General Development Quotient (GDQ) that is obtained by adding the standard scores from all five subtests administered in the DAYC. The sum of scores is then converted into another standard score and used as a GDQ indicator for the participants' development. A mean score of the group's pre and post GDQ scores was acquired, the pre-test mean score was a 102.09 and the post-test mean score was a 106.09.

The participant post-test scores had great variations in regards to gains and reductions, however nine out of eleven participants showed gains in their GDQ scores. It may appear as if though development regressions occurred, however these variances in GDQ's could be attributed to the increased criterion set for the participants' age maturation. There were no individual increases that could be considered significant gains in the overall GDQ scores.

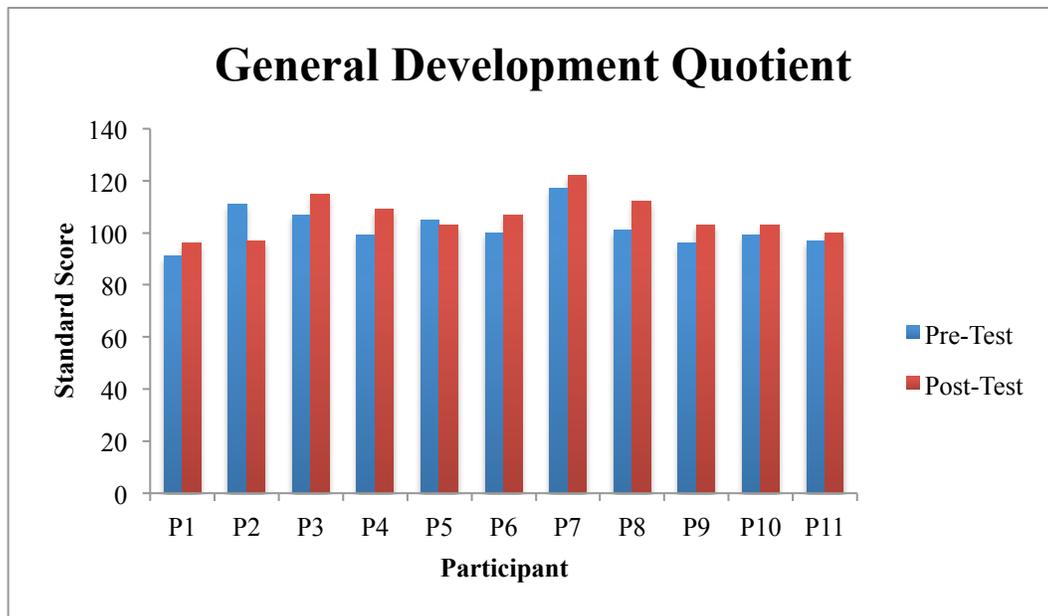


Figure 3.1: This table displays the pre and post-test scores the infants received on their General Development Quotient (GDQ). Results displayed that nine out of eleven infants showed an overall increase in their GDQ scores.

The DAYC looks at five areas of development: cognition, communication, physical, social-emotional, and adaptive behaviors. This study focused on the results of the areas of cognitive and communicative development. The cognitive subtest standard scores averaged a 100.63 for pre-test scores and a post-test score of 106.09. Though the increase was slight, individual increases occurred in seven

out of ten participants, while one participant did not show any difference. Only one participant (P4) showed a significant increase in the pre and post-test score, an increase of over one standard deviation, from pre-test score of 85 to post-test score of 117.

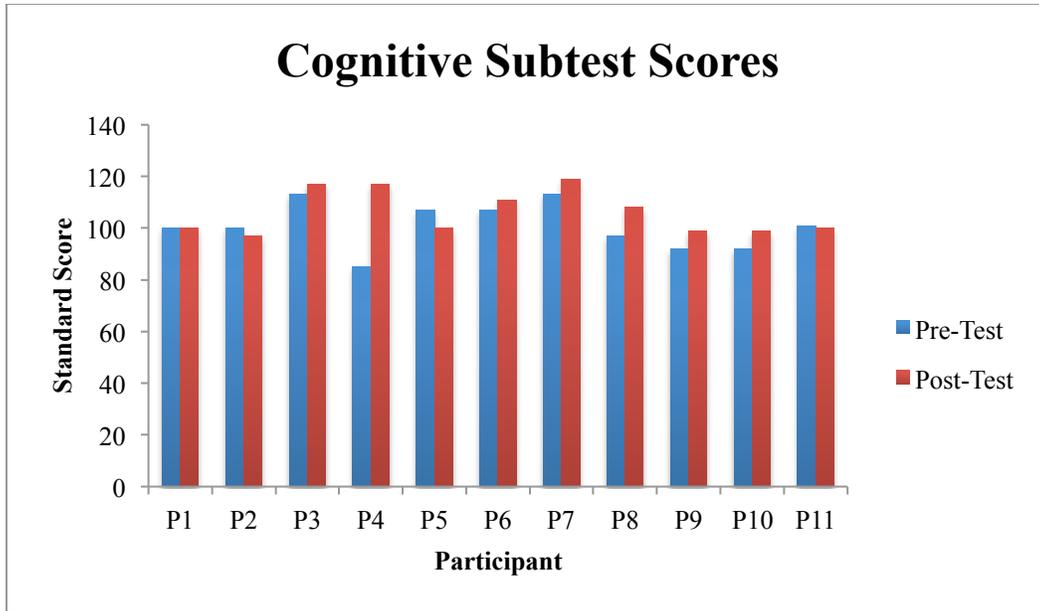


Figure 3.2: Graph 3C displays pre and post-test scores in the cognitive subtest taken from the DAYC. Seven out of ten participants showed an increase in cognitive development, two showed a slight decline, and one did not display any change.

The group pre and post-test scores had high variations, the group average pre-test was 99.90 and post-test was 101. Though there was a slight increase in the group mean, only five of eleven participants showed an increase in the communication subtest. A factor unaccounted for in the communication subtest is nonverbal communication, such as sign language used in productions and responses. The mean did increase slightly for the group, however it is still essential to mention that there was no developmental regression. All participant developmental benchmarks increased, therefore when translating raw scores into standard scores, new age brackets (8-9 months, 10-11 months, etc.) had to be used. The overall time between pre-test and post-test administration was approximately three to four months total, meaning the infants may have had to move up one to two brackets. Even if the infant had barely turned 10 months, they were still being ranked developmentally with an infant who is 11 (almost 12 months) which can help show why there is such a discrepancy in the standard scores. For example, during the pre-test administration P11 was 29 months old, which was in the middle of an age bracket

(29-30 months), and during post-test administration P11 was 31 months old, which was the beginning of an age bracket (31-33). This means that P11's post-test conditions and developmental markers are more demanding of his developmental abilities when compared to pre-test markers and his age. These types of occurrences should be taken into consideration with the displays of decreased standard scores.

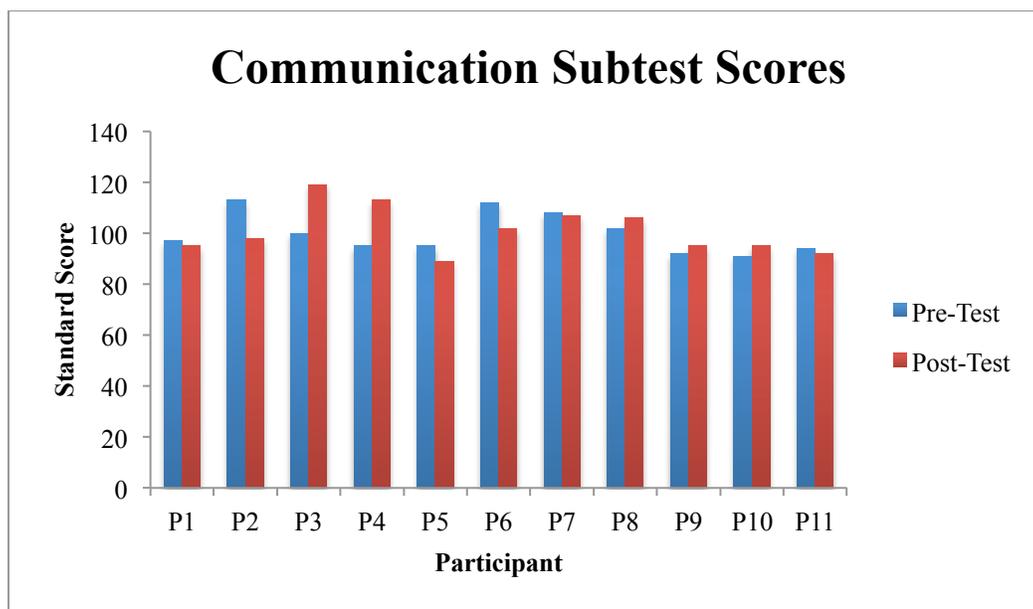


Figure 3.3: This graph displays the scores for each participant on the cognitive subtest taken from the DAYC. Only five of eleven participants displayed an increase in their post-test assessment standard score.

A statistical analysis was completed using the Wilcoxon signed-rank test, which is a non-parametric analysis of two nominal variables (pre and post testing) to determine if there were differences in the population's mean ranks (McDonald, 2009). The statistical analysis for the cognitive subtest scores resulted in $z=-1.79$ with a significance of $p=.074$, indicating no statistical significance. The statistical results for the communication subtest resulted in equivalent type scores of $z=-.267$ with a significance of $p=.789$, with no statistical significance found. Although no statistically significant gains were made, the results of the pre and post-test assessments did show an overall increase in the groups development. The surveys that were used to help assess the infant's developmental milestones also provided very helpful qualitative data for the researcher to use as baseline and compare to observations provided during the post-test assessment.

One of the pre-test surveys provided for guardians was the Infant Interaction Survey (Appendix D) created by the researcher to determine the levels of interaction the infant was going to have with the parent/caregiver who attended the baby sign workshop. One of the benefits to the workshop was that any and all caregivers were invited to attend, the group of caregivers who attended classes with the infant participants included parents, siblings, and grandparents. Before the results of the survey are discussed, it should be mentioned that the researcher made note of all caregivers, and their relation, in attendance of the baby sign workshop. All participants attended the baby sign workshop with at least one parent and three of the eleven infants had a grandparent who attended the workshop at least one of five classes along with the parent(s). All caregivers that filled out the interaction survey reported that the infant's parent(s) did work, however only one participant (participant 1) attends daycare. The caregiver of P1 reported that the infant spends the most time communicating with daycare employees; P5, P6, and P8 reported communication exchange occurs most with a relative or grandparent, while the rest of the participants reported that parents were the primary communication partners with an average time of 8 hours per day of interaction with their infants. This time accounted for an average daily interaction period during a weekday. The following chart displays the infant's primary communication partner(s) as reported in the infant interaction survey.

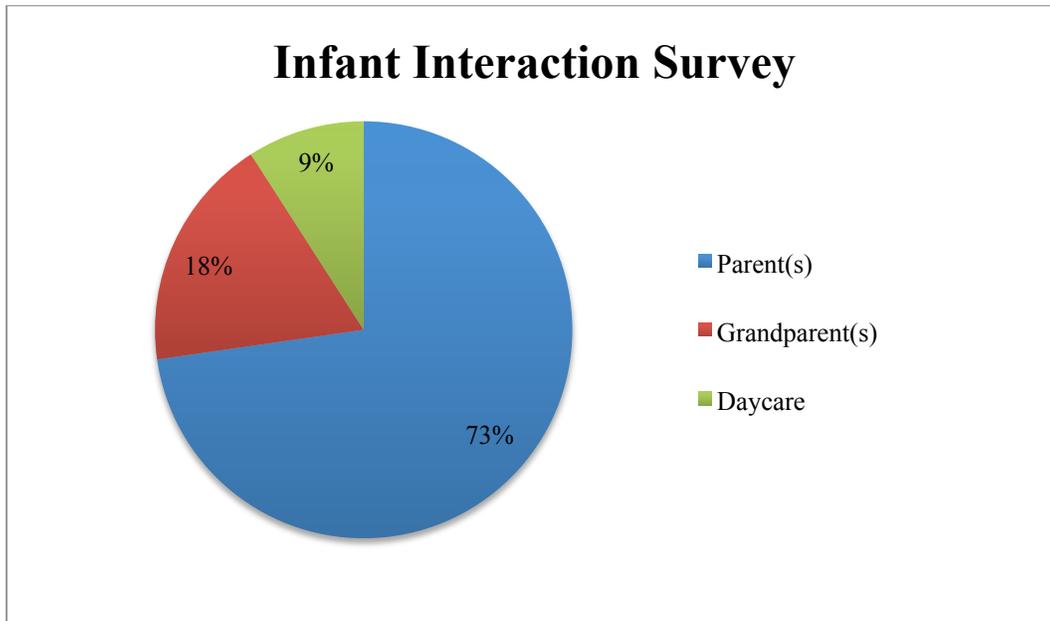


Figure 3.4: The chart displays the percentage of primary communication partners of the infants whom participated in the study. The majority reported that parents were the primary communication partners, while the remaining stated grandparents and daycare were the primary interaction partners.

While the majority of parents reported that they are the primary communication partners, it can be assumed that the hours that the parent(s) are at work, the infant communicates with the relative that is taking care of them. The infants who showed gains in both the cognitive and communication subtests (P3, P4, P8, P9, P10) were all infants whom had parents, reportedly the primary communication partners, which attended the baby sign workshop. Of these participants; P8, P9, and P10 all had grandparents, who were also reported as some of the most frequent communication partners, that attended the baby sign workshop. It is probable that parents/caregivers who attended the workshop were more likely to integrate sign into their everyday communication exchanges than caregivers who were not exposed to the signs from the workshop. This indicates that the infants who had the most exposure to the baby sign resulted in having greater growths in development. This correlation is also supported with the results of participant 1 whose common communication partners were caregivers other than the parents. P1 did not display any gains in development for the cognitive subtest as well as had a decrease in their standard score for communication. If the infant's main communication partner was not taught the baby signs from the workshop, it can be assumed that the infant was not exposed to the signs as often as the

infants who did have primary communication partners attend the class. Therefore, this correlation can be possibly attributed to the frequency of sign exposure that the infants were exposed to.

Although results did not indicate a significant difference for the overall development of infants, or any areas specifically, the study brought about significant qualitative data that should be taken into account. All workshop participants were provided with a Post-Workshop Survey (Appendix D) to complete that addressed the areas of confidence of sign usage, stress levels, observed changes in language, and different signs being used by infants. When parents were asked “ How confident are you in your ability to use sign with your child?” approximately seven out of the nine (78%) families that participated answered that they felt “very confident”, while the remaining two (22%) reported feeling “somewhat confident” with their baby sign use. All caregivers reported that the baby sign workshop was not stressful, however two families (22%) did report that using sign with their children was stressful. These families commented “at first it was because my baby would not pay attention, but after being assured...the baby does pay attention, it became easier” and “just that they sometimes don’t pay attention or that we think they’re not”. The families only reported feeling stressed having to sign with their infants due to a lack of attention, the participants whom reported these feelings were the caregivers of the youngest participants in the workshop, which helps researchers understand why there was such a lack of attention.

The survey also inquired about any language changes that were observed by the caregivers over the course of time that the baby sign workshop was held. Four of nine families (44%) observed an increase in eye contact the infant was making, three families (33%) also reported that the infant seemed to attend more to hands, gestures, and overall body language than before the baby sign workshop. 33% also affirmed an increase in vocalizations and word use when the signs were being used as well as signs being used as a source of communication for the infants. The survey also helped provide information regarding the opinions and thoughts on the effectiveness of the workshop, parents reported that they enjoyed the workshop due to the interaction they were receiving with their infants as well as other parents (55% total reported this), while 22% reported enjoying the extra interaction with their infants specifically. Another 22% of participants stated that they enjoyed the bonding and learning experience

that they were receiving with their infants and families. All families (100%) reported that they will continue to use baby sign as a form of communication because of the increased communication (55% reported) that baby sign facilitates as well as the reduced frustration (33%) that coincides.

During the post assessment administrations, researchers questioned caregivers as to the infant's use of signs and communication preferences. Some parents (P1, P7, P8, P9) mentioned that their infants were using baby sign fairly consistently with verbal productions. All but one family reported their infants using at least two signs consistently during communication. The number of signs being used by the infant consistently ranged from 0-26; mean of 7 signs and a mode of 5 signs. The most popular signs being used by the infants were "more, please, thank you, eat, [and] stars".

There were interesting observations made by the caregivers for each of the participants. The caregivers for P1 and P2 reported that there was an increase in attention of the infants and that they seemed to look back and forth from eyes to hands more often. P7 was the infant who reportedly used up to 26 signs consistently however on request or during labeling could produce even more signs. P11, the oldest of all participants, did not use signs as often as verbalizations but did seem to use the signs during times of frustration or anger. The report of consistent sign use and increased verbalization was especially intriguing for P9 and P10, whom had been previously diagnosed with a language delay. Both infants had increases in overall development and the specific areas of cognition and language as well as an evident increase in verbalizations when comparing pre to post-test assessment observations. The infants' caregiver reported that they were using signs often, but also reported a significant increase in the production of language verbally. Pre-test, these infants only had a reported expressive lexicon of 10-15 words used inconsistently, with poor repetition skills. Post-test the twins displayed a lexicon of approximately 50-100 words accompanied with more direct repetitions of utterance models.

Another area of significance is the acquisition of signs for the parents/caregivers who attended the baby sign workshop. It became apparent that as the course progressed, the participants were picking up the signs more promptly than during the first two classes. The amount of instruction time necessary for the caregivers to grasp the signs decreased significantly, indicating the more exposure they had to different signs and sign language helped with their ability to recall and retain new signs. The same type

of correlation was made with the infants previously, the more exposure to sign they received can be correlated with their overall use of sign. This correlation could have occurred for a number of reasons, one of which being having an improved familiarity of exceeded body and hand gesture movements. Many of the workshop participants reported, during the first few classes, that some of the signs felt unnatural and were difficult to produce. As the classes progressed, those complaints decreased and the participants were more accurate with their signing productions.

Chapter 4: Discussion

This study sought out to determine if parent/caregiver implementation of baby sign into an infant's routine would result in an increase of cognitive and language development. Specifically, if there would be an increase in cognitive characteristics that are advanced for the infant's chronological age and if any early language development would occur due to the baby sign implementation.

The researcher hypothesized that there would be a correlation found between the development of cognition to the development of language or vice-versa. The majority of results found support this correlational relationship. Six of the eleven participants showed an increase in their cognitive development as well as their language development standard scores, while three of eleven showed a decline of standard scores for both subtests. This indicates that approximately 82% of the participants' standard scores for cognitive and communication subtests had a correlational relationship. The remaining 18% percent, or two participants, showed an increase in standard scores for only one of the two subtests, which displays an inconsistency with the correlational relationship that was hypothesized. The researcher also hypothesized that there would be advanced cognitive characteristics displayed for the participants' chronological ages during the post-test assessment. This was not supported with the results found, due to the lack of statistical significance in the pre and post-test scores for the cognitive subtest. Only one participant showed a significant increase from pre to post test assessment, which was determined to be significant due to the difference in scores being more than one standard deviation. The final hypothesis made by the researcher was also not supported by the results found. There were no significant gains in early language development that were observed or recorded in the results besides for two participants, who did show an increase of more than one standard deviation. However, since this only occurred for two of eleven participants, the results do not hold enough influence to support the hypothesis made.

This study's results coincide with, but also challenge, previous studies on the topic of baby sign's effect on infants. Consistent with Brady (2007) it was reported that infants did display decreased frustration levels. This was noted in the parental survey provided after the workshop was completed. Parents reported that their infants seemed better able to communicate with others and consequently reported that frustration levels seemed to decrease. This study's correlational results also supported previous notions made by Goodwyn, Acredolo, and Brown (2000) whom found that receptive language was not hindered by any sign use or gesture use, but rather still continued to develop normally. In this study when the sign trained group was compared to the control for receptive language, the sign trained group did out perform the control group, however the difference was not significant enough to make a correlational relationship. In relation to the current study, parents/caregivers reported that their infants did not seem hindered in any form due to the use of baby sign. In fact, the majority of parents reported that their infants seemed to have advances in their language use.

However, adult participants of this study did report noticing increases in their infants language and communication skills, this contradicts findings from Capirci, Iverson, Montanari, and Volterra (2002) who reported that their participant was neither at an advantage or disadvantage to his peers who did not practice any sign language. This study also reported that as word use increased, signing levels decreased, which was also inconsistent with what parents/caregivers reported about their infants. From what the parents/caregivers reported, the infants did not seem to decrease their levels of sign language, however this dissimilarity from the research study could be attributed to the time span that each of the studies had. These variances could be due to the populations being used in each study and the styles of parent implementation and sustainability used.

It is imperative to note that the researcher is not making any cause-effect relations between the results and the baby sign training. All results and comments made are based off of the correlational relationships that the researcher found from the assessments and surveys provided to the study's

participants. No evidentiary claims can be made from a case study design, and therefore the correlations and results reported are merely correlational and qualitative relationships observed from the data.

Limitations

Due to the study's design, population used and the time frame of study there are a vast amount of improvements that can be made if the study is duplicated. The biggest threat to the internal validity of this study was natural development and maturation of the infants. All participating infants were determined to be typically developing which consequently means that development of both language and cognition can always be attributed to their maturation and growth over the span of the study. To attempt to control for this limitation, researchers attempted to keep the post analysis within a month, to a month and a half, to help attempt to minimize the results being accounted for due to maturation alone. This time frame was long enough to allow researchers to create correlations observed to be related to the use of baby sign language, but short enough to help ensure that maturation and development were not the sole causes of the differences in the participants. Originally, the researchers wanted to keep the time between pre and post testing exactly five weeks apart, however due to a lack of participants the workshop was pushed back two weeks, which created a gap for those participants who were tested immediately before the initial date of the workshop. After the workshop was rescheduled, the rest of the participants were tested and then all participants were reassessed around the same time after the baby sign course. The age variation of participants can also fall under the maturation limitation. The age range was not ideal because it creates a great discrepancy, however still provided helpful information in regards to the effects of baby sign language on the different areas of development over the span of childhood age groups.

Another potential limitation of the study was that not all parents who participated in the class were the primary interaction partners of their infants. This lack of interaction with an adult who participated in the baby sign course left those infants at a disadvantage to those whose parents attending

the course and implemented it at home with them frequently during interaction. This disadvantage decreases the possibility of baby sign language carrying over into the home. This also moves into the limitation of the small group size for both parents/caregivers as well as infants involved. Due to a lack of participants, the sample size that was used in the study was very limiting. The validity is also at risk due to the amount of surveys and observation records that the parents were asked to complete on their infants. The risks regarding subjective surveys and checklists is that the participants who are filling them out are not providing valid information. Inaccurate information can be omitted or added into these questionnaires, which would effect the correlational observations made by the researcher from this information. This is a validity issue that could not be avoided because the study's participants were infants and they are unable to report for themselves.

The most significant confound in the study was the lack of a control group. This setback was in large part due to a lack of parents/caregivers willing to participate with their infants. However, this group case study is still very significant in this area of research because of the lack of information on baby sign and its effects on cognitive and language development. Research, especially evidence-based research, has to have a beginning point and this case study could be the start of a new trending research topic.

Another limitation of the study was the amount of researchers who conducted the assessments. One, two, or three researchers involved in the study conducted each assessment on the infants. Each researcher involved in the study focused on a different area of infant development; cognitive and communication, physical development, and social-emotional development. This created many inconsistencies in the types of testing environments used as well as time needed for each assessment.

Future Research

Future research studies on this topic area may want to continue using typically developing populations but use a control group to better the results of the study and to allow for cause-effect

conclusions. It would also be recommended that future studies expand the number of participants that are in the study along with opening up signing classes to not just parents and primary caregivers but to those who interact with the infants on a daily basis; even their siblings (regardless of age). Continuous research on the literature of baby sign and its effects is essential in conducting a well-controlled research study in this area and in any area of research. Baby sign is still a fairly new and undeveloped research topic in the field of Speech-Language Pathology and this type of preliminary research is key. These types of preliminary studies are the foundation for more controlled studies and help create a better array of treatment techniques for professionals to use that are evidence based. Baby sign language and basic ASL are used in therapy by Speech Pathologists constantly as a therapeutic intervention method for children who are nonverbal, language delayed or disordered, or as an alternative means of communication. For this type of intervention to be considered evidence based there needs to be more research on the area of baby sign specifically to continue to ensure the credibility and efficacy of the Speech Pathology profession.

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Appendix

Appendix A

Infant Interaction Survey

Infant's Date of Birth: _____ Infant's Participant #: _____

1. Do parent(s) work?
 full time part time self-employed not applicable
2. Who spends the most time communicating with the infant?
 parent(s) relative nanny other _____
3. How much interaction time is spent with the infant and their primary caregiver on a daily basis?

4. Does the infant attend daycare? If yes, how many hours daily?

5. Does the child have siblings? If so, how many and what ages?

Appendix B

Assessment of Language Development

Name: _____ Age: _____ Date: _____

Examiner's Name: _____

Instructions: Mark a plus (+) or a check (✓) if the child *does* exhibit the behavior, a minus (-) or a zero (0) if the child *does not* exhibit the behavior, and an *S* if the child exhibits the behavior *sometimes*. This form can be used during informal observation or completed by a parent or knowledgeable caregiver. Because children develop at different rates, avoid using strict application of the age approximations. The time intervals are provided only as a general guideline for age appropriateness.

0–6 Months

- _____ Frequently coos, gurgles, and makes pleasure sounds
- _____ Uses a different cry to express different needs
- _____ Smiles when spoken to
- _____ Recognizes voices
- _____ Localizes to sound
- _____ Listens to speech
- _____ Uses the phonemes /b/, /p/, and /m/ in babbling
- _____ Uses sounds or gestures to indicate wants
- _____ Responds to *no* and changes in tone of voice

7–12 Months

- _____ Understands *no* and *hot*
- _____ Responds to simple requests
- _____ Understands and responds to own name
- _____ Recognizes words for common items (e.g., cup, shoe, juice)
- _____ Babbles using long and short groups of sounds
- _____ Uses a large variety of sounds in babbling
- _____ Imitates some adult speech sounds and intonation patterns
- _____ Uses speech sounds rather than only crying to get attention
- _____ Listens when spoken to
- _____ Uses sound approximations
- _____ Begins to change babbling to jargon

7–12 Months (continued)

- _____ Uses speech intentionally for the first time
- _____ Uses nouns almost exclusively
- _____ Has an expressive vocabulary of 1 to 3 words
- _____ Uses characteristic gestures or vocalizations to express wants

13–18 Months

- _____ Imitates individual words
- _____ Uses adult-like intonation patterns
- _____ Uses echolalia and jargon
- _____ Omits some initial consonants and almost all final consonants
- _____ Produces mostly unintelligible speech
- _____ Follows simple commands
- _____ Receptively identifies 1 to 3 body parts
- _____ Has an expressive vocabulary of 3 to 20 or more words (mostly nouns)
- _____ Combines gestures and vocalization
- _____ Makes requests for more of desired items

19–24 Months

- _____ Uses words more frequently than jargon
- _____ Has an expressive vocabulary of 50–100 or more words
- _____ Has a receptive vocabulary of 300 or more words
- _____ Starts to combine nouns with verbs and nouns with adjectives
- _____ Begins to use pronouns
- _____ Maintains unstable voice control
- _____ Uses appropriate intonation for questions
- _____ Is approximately 25–50% intelligible to strangers
- _____ Asks and answers “What’s that?” questions
- _____ Enjoys listening to stories
- _____ Knows 5 body parts
- _____ Accurately names a few familiar objects
- _____ Understands basic categories (e.g., toys, food)
- _____ Points to pictures in a book when named

Appendix C

Cognitive Characteristics Checklist

Instructions: Mark a check (✓) for characteristics that are *consistently* present in your infants behavior, mark a minus (-) for characteristics that are not present, and mark an X (X) for characteristics that are present but inconsistent or that they sometimes do.

Piaget’s Six Sub Stages Sensorimotor Stage of Cognitive Development

Stage	Age (months)	Characteristics present*
Reflexive	0 – 1	<input type="checkbox"/> Egocentric <input type="checkbox"/> Inability to differentiate themselves from objects
Primary circular reactions (repetition of spontaneous pleasant behaviors)	1-4	<input type="checkbox"/> Repeats actions they find interesting <input type="checkbox"/> Earliest intentional acts <input type="checkbox"/> Earliest behavior repetition <input type="checkbox"/> Eyes follow objects until they are out of view <input type="checkbox"/> Out of sight, out of mind <input type="checkbox"/> Inability to differentiate self from objects <input type="checkbox"/> Holds up their head <input type="checkbox"/> Smiles
Secondary circular reactions	4-8	<input type="checkbox"/> Purposefully repeats actions <input type="checkbox"/> Understand actions achieve goals (means-end) <input type="checkbox"/> Object recognition <input type="checkbox"/> Imitates actions that are in repertoire (inventory) <input type="checkbox"/> Anticipates moving objects new position <input type="checkbox"/> Thinks they are as the cause of all events <input type="checkbox"/> Shows growing interest in the environment <input type="checkbox"/> Combines new stimuli into existing schemes
Coordination of secondary circular reactions	8-12	<input type="checkbox"/> More deliberate behaviors <input type="checkbox"/> Crawling <input type="checkbox"/> Gaining knowledge of object permanence <input type="checkbox"/> Searches for objects where they were last seen <input type="checkbox"/> Coordinates schemas <input type="checkbox"/> Applies known resources to new ends <input type="checkbox"/> Mimics new actions not in repertoire <input type="checkbox"/> Understands that objects can cause action <input type="checkbox"/> Establishes goals before beginning activity <input type="checkbox"/> Foresees outcomes

Tertiary circular 12-18

- _____ Invents new resources to an end
- _____ Walking
- _____ Mimics behaviors that are very different than their own
- _____ Aware of where objects are located in reference to others
- _____ Realizes that they are one of many objects that is in their environment
- _____ Uses tools

***Characteristics of the sub stages taken from Shipley and McAfee (2009).**

Appendix E

Baby Sign Course Outline & Word List

Week 1 – Family Members & Greetings

- Hello
- Good-bye
- Mom
- Dad
- Brother
- Sister
- Grandma
- Grandpa
- I love you
- Cousin
- Aunt
- Uncle
- Baby
- Boy
- Girl
- Please
- Thank you
- Good morning
- Good night
- My/Your

Week 2 – Food Items & Verbs

- Want
- Hungry
- Thirsty
- Give me
- All done
- More
- Yes/No
- Milk
- Juice
- Banana
- Apple
- Cookie
- Cracker
- Water
- Hot/cold
- Orange
- Candy
- Eat
- Drink
- Cheese

Week 3 - Toys, Playtime & Animals

- Play
- Toys
- Ball
- Bear
- Car
- Airplane
- Dog
- Cat
- Bird
- Cow
- Sheep
- Horse
- Elephant
- Book
- Tiger
- Monkey
- Bubbles
- Outside
- Bike
- Walk

Week 4 – Emotions & Routines

- Happy
- Sad
- Mad
- Scared
- Cry
- Sorry
- Sleepy
- Up/down
- Hurt
- Diaper
- Brush your teeth
- Bath
- Dirty
- Clean
- Help
- Shoes
- Clothes
- Where
- Go
- Sit
- Stop

Week 5 – Miscellaneous

- Recap of everything Free day for parents to bring in items that they want
- Parents bring in a list of signs that they want to learn

Extra list/miscellaneous:

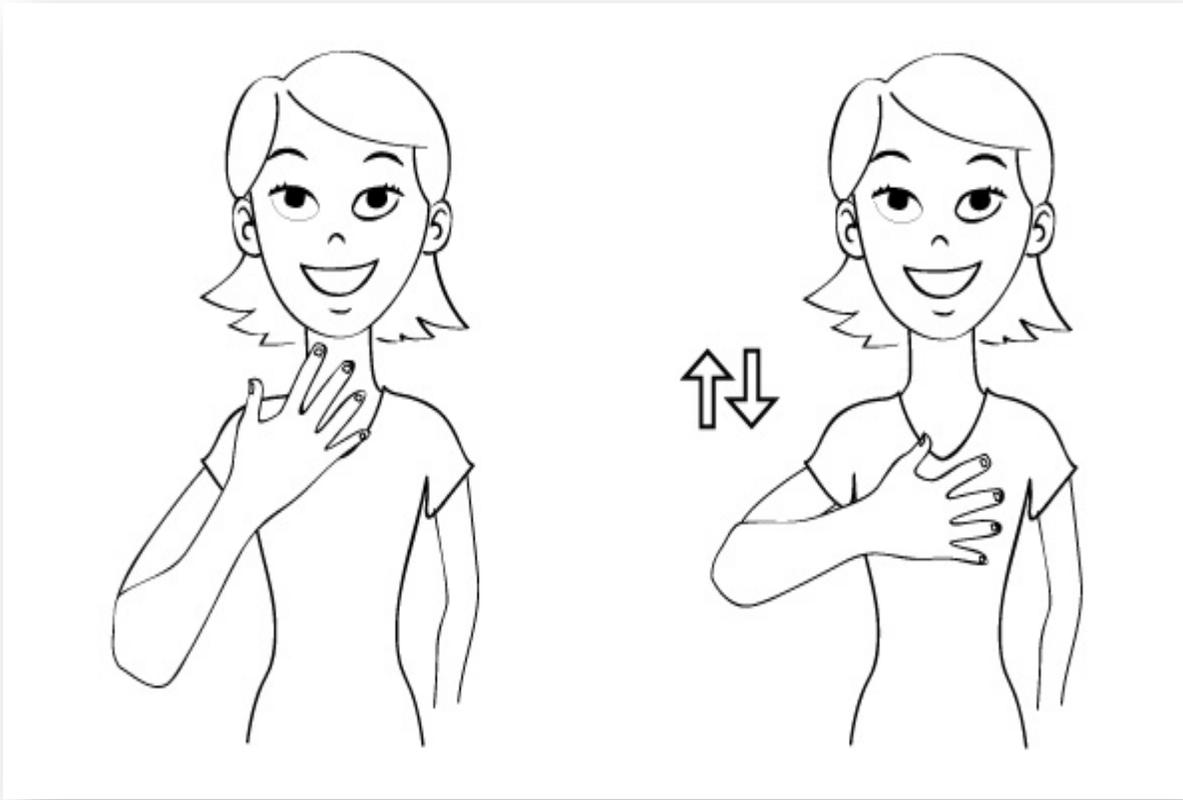
- Red
- Blue
- Yellow
- Green
- Black
- White
- Noodles

- Jump
- Slide
- Moon
- Music
- Star
- Sun
- Home
- Keys
- Phone
- Show
- Look
- Work
- Ice cream

Appendix F

Example of handouts used during baby sign course as a take home reinforcement.

HAPPY



Explanation: To sign *happy*, take your extended hand and brush it in little circles up your chest a couple of times.

Implementation: Teach your baby the sign for *happy* by making the sign whenever your baby is visibly *happy* or excited. Remember, when making the sign for happy, it is important to emote happiness.

Curriculum Vita

Clarissa Navedo was born in Laredo, Texas and moved to El Paso, Texas in 1998 where she graduated from Coronado High School in May of 2008. Clarissa became a student of the University of Texas at El Paso (UTEP) in fall of 2008 where she attended courses full time, worked, lived on campus and involved herself in extracurricular activities. Clarissa completed three years of undergraduate course work and was admitted into UTEP's graduate program for Speech-Language Pathology in 2011, under the five-year Master's program. As a graduate student Clarissa conducted research involving the impact of baby sign on infant development and presented her findings at the Texas Speech Hearing Association's annual conference in April of 2013. Clarissa will receive her Master of Science degree in Speech-Language Pathology on May 18, 2013. Clarissa plans on continuing research in the area of baby sign's effects on infant development and hopes to begin researching other areas of interest to her.