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The Effects of Baby Sign Training on Child Development

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Abstract

Introduction: Baby sign has gained the attention of many researchers and parents. Relatively little is known about the use of baby sign and the impact it has on the development of children. As the use of baby sign increases in popularity, research studies have had limited and inconsistent results regarding its influence. **Purpose**: The purpose of this study is to measure the effects of baby sign training on the overall development of normally hearing children while improving on the limitations of current studies (between group study). **Methods**: Participants in the study included 22 children, ages 6 months to 2 years; 5 months (11 children who received the baby sign work shop, and 11 children who were used as a control group). The experimental and control group were administered a pre- post-test to assess, communicative, cognitive, social, adaptive behavior, and physical development. **Results/Conclusion**: There was no statistically significant difference between the pre- and posttest scores of the control group compared to the experimental group.

Keywords: baby sign, gesture, child development

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Background And Significance

Introduction

Baby signing is the use of sign language with typically developing hearing children. Baby sign was defined by Doherty-Sneddon (2008) as an "augmentative communication approach that teaches babies keyword signing that they can use to communicate before they can talk" (pg. 300). Doherty-Sneddon (2008) describes baby signing as a movement that has become increasingly popular amongst parents whom have heard of the claimed benefits. The investigation of baby sign has raised the interest of researchers who are curious about the impact of baby sign on child development. Due to limited empirical data on the impact of baby sign, the current study was developed to analyze the effects of baby sign training on the cognitive, social-emotional, communicative, adaptive behavior and physical development of children.

Baby Sign Research

As social media becomes easier to access, parents can effortlessly retrieve facts regarding baby sign and the claimed benefits it provides. Parents have access to several websites and applications that promote the use of baby sign. These websites and advocates for baby sign provide and advertise instructional books and videos, and publicize parent's claims of their children's significant growth in communication and decrease in frustration between parent- child interactions. (Nelson, White & Grewe, 2012).

Pizer et al. (2007) states that parents choose baby sign due to the ideologies about language and child rearing that meet parents' perceived needs. The author goes on to say baby sign is chosen to strengthen the clarity of parent-child communication, which can be enticing to parents. The claimed benefits of baby sign include; early indication of communicating wants and

needs, higher-level speech and language development, strengthened parent-child bond, improved literacy, increased IQ and cognitive skills, reduced frustration and emotional tantrums, and increased self-esteem and feeling of satisfaction and accomplishment. These claimed benefits are what attract parents to baby sign training (Doherty-Sneddon, 2008; Nelson et al., 2012). Due to the immense scope of benefits that advocates promote, it is reasonable that parents are drawn to baby sign.

As baby sign gains in popularity, research studies have had limited and inconsistent results regarding influence of baby sign on typically hearing children (Doherty-Sneddon, 2008; Johnston et al., 2005; Nelson et al., 2012). Nelson et al. (2012) indicate that out of 33 websites that encouraged parents to teach sign language to their infants, 90% of the citations provided from the websites consisted of opinion articles or had descriptions of products for purchase. The authors go further to say that only eight of the citations provided were empirical research analysis that were related to the impact of baby sign exposure.

Although research is limited, there is data that supports the idea that the use of baby sign enhances communication and cognitive ability. A study done by Holmes and Holmes (1980) found that a child's expressive communication using both sign and oral modalities increased with the exposure of sign language. The infant was exposed to sign language and spoken English simultaneously since birth from both of his hearing parents. The infant demonstrated an extensive vocabulary in both sign and spoken words when compared to typically hearing infants at one year and five months. At 6.2 months the infant produced his first sign and his language acquisition continued to increase at an accelerated rate. Homes and Homes (1080) concluded that baby sign has a positive impact on vocabulary and communication skills.

In a study conducted by Daniels (1994) the lexicon of young hearing children was positively impacted by the exposure of baby sign. This particular study examined the impact of sign language in young hearing children and their language development over time. The researcher tracked the progress of pre-kindergarten students throughout the year and reported gains in vocabulary. The results of the study displayed significant vocabulary gains and were reported to be persistent throughout the year that followed. The author concluded results supported T.H Gallaudet's notion, that the use of sign language as an additional modality provides a rich language base for early learners. Gallaudet believed hearing infants who received the combination of sign and oral communication would have greater gains in language development and retain it for a longer period of time (Hoemann and Koenig, 1990).

Research conducted by Goodwyn, Acredolo, and Brown (2000) found that when 11-month-old hearing infants were trained on symbolic gestures for objects, requests and conditions, they exceeded toddlers who were not introduced to symbolic gestures on standard language assessments at 11, 15, 19, and 24 months. However, when the children were evaluated at 30 and 36 months, there was no significant discrepancy. Acredolo and Goodwyn (2002) did a follow up study and found that IQ scores were considerably higher when children were introduced to baby sign as compared to a control group.

Regarding the impact of baby sign on an infant's motor development, there is little empirical research. A study done by Bonvillian, Orlansky and Novack (1983) found a positive impact on the comparison of the rate of acquisition of new signs and the rate of motor development. In contrast, in a systematic review done by Johnston, Duriex-Smith and Bloom (2003), the authors did not find an impact on motor development when infants were introduced to baby sign language.

Nelson et al. (2012) stated that conclusions could not be made regarding the impact of baby sign on child development due to the lack of empirical support. Johnston et al. (2005) agree. The authors underlined various methodological limitations in a review of 17 studies that analyzed the effects of baby sign on child development. Among the 17 studies, not one of the studies included established control groups or used randomized control trials. Furthermore, nearly all of the studies included small sample sizes and did not provide follow-ups.

A recent study by Kirk, Howlett, Pine, and Fletcher (2013) has made an effort to improve on the limitations of previous empirical studies. This study is the first extensive randomized controlled trial that measured the effects of baby sign on parent-child communication and language development. The study consisted of four groups, a symbolic gesture (SG) training group, a British Sign Language (BLS) group, a verbal training (VT) group and a no intervention control (NC) group, in which caregivers and their children were appointed to randomly. Kirk, Howlett, Pine, and Fletcher (2013) included the SG group because several baby sign programs encourage symbolic gesturing.

Mothers of the infants in the SG, VT and BSL groups were informed that they needed to gesture, sign, or label a fixed assigned of target words individually. Two home visits were scheduled. When the children were eight months of age the researcher made the initial home visit where they implemented 10 target gestures/signs/labels to the parents and supplied them with a training package for the 10-targeted gestures. The training packet consisted of still pictures that illustrated the signs/gestures and provided recommendations of how to execute them in every day routines. When the infants were 12 months old the researcher made the second home visit and introduced another 10 gestures/signs/labels.

Prior to the implementation of the 10 target gesture/signs, when the participants were at eight months, the infants were evaluated on their expressive and receptive language. The infants were also evaluated after the implementation of gestures signs at 12, 16, and 20 months. During the study the authors did not find any significant differences between the evaluation scores in the experimental and control groups. Consequently, Kirk, et al. (2013) stated in their conclusions that the claimed benefits of baby signing could not be justified by the data.

Kirk, et al. (2013) also used general linear models (GLM) to analyze differences between children of low and high abilities and gender. In the BSL condition, the results indicated a significant different between expressive and language abilities between low and high-ability male children. In other words, expressive language abilities increased for boys with low language proficiencies. The authors note that these results demonstrate that baby sign may be beneficial for young children who exhibit low language proficiencies and may compensate for language impairments. Furthermore, the researchers conclude that baby sign can improve a poor linguistic environment and can lead to maternal interactions causing them to respond to their child's nonverbal cues at an earlier age. Lastly, the authors state that children with a language delay or impairment may benefit from using gestures/signs.

In addition, Kirk, et al. (2013) analyzed mother-infant interactions when the infants were 10, 12, 16, and 20 months to examine whether baby sign had an effect. The authors found that maternal interactions had changed in the SG and BSL groups. The mothers had positive changes in the way they responded to their infant's nonverbal cues causing them to perceive them as communicative partners earlier than expected. Furthermore, the authors found that mothers who signed to their infant stimulated more independent actions by their child.

Although, Kirk, et al. (2013) provided valuable information on the impact of baby sign in their study, it was not without limitations. The researchers noted that infants may not have had improved language abilities possibly because they were beyond the threshold of improvement (Kirk, et al. 2013). The mothers in the study had very little gesture/sign training, and were given few signs to implement. Further Limitations related, treatment integrity, treatment design and methodology. The caregivers were provided with very little training on gesture/signs. Firstly, the researchers only introduced 20 signs to the mothers throughout the full sequence of the study. If the authors had provided the mothers with more signs, they would have had more possible signs to implement that would have been relevant to their everyday use. Caregivers did not have an opportunity to suggest possible signs that would be of more use to them and their infants. The researchers trained the mothers by demonstrating the signs and verified whether the mother could produce them. The researchers did distribute a handout including illustrations of the signs and recommendations of how to implement them during their day. However, the researchers failed to go over the recommendations with the caregivers, leaving the mothers no time to prepare and practice correct implementation of the signs at home.

In regard to treatment integrity, the caregivers informed the researchers that they implemented the gestures/signs only a few times during a week with their infants. The lack of exposure of the signs would not make the treatment effective enough for the infants to have any significant influence. The process of recruitment may have caused this issue. Kirk, et al. (2013) intentionally did not provide the extent of the study to potential participants nor did they have any interest in baby sign. Had they been, baby sign may have been implemented at home to a greater extent. In addition, no details were provided by the authors related to how the caregivers implemented the signs at home with their infants.

Although, the design of the study was creditable, the treatment groups that the researchers constructed is questionable. Kirk, et al. (2013) incorporated a British Sign Language (BSL) group and a Symbolic Gesture (SG) group. Once more, the reason the researches give for including SG was to represent the type of sign or gestures that several baby sign organizations advocate for. Firstly, the researchers did not provide a reference to justify that notion. Secondly, one could make an argument that any implementation of symbolic gestures can be considered sign language. It can be debated that the difference between formal sign language and symbolic gesture is related to iconicity, formal signs are less iconic than symbolic gestures. Nonetheless, the infant is still accountable for matching the sign to its correct referent just as they would with oral communication. It may be that an infant would not be able to tell the difference of acquiring what we describe as a symbolic gesture or formal sign.

Lastly, the researchers noted that infants did not have improved language abilities because they were beyond the threshold for improvement. The majority of the infants in the study came from middle or upper class environments, which are more inclined to have stronger language proficiencies than those who come from a lower socioeconomic status (Kirk et al. 2013). Consequently, the infants may not have had the chance to show improvement due to their high language proficiency levels and the poor treatment implementation from the caregivers. However, it is critical to restate that the authors did find evidence to demonstrate that expressive language abilities increased significantly in males with the lowest scores on language tests.

Purpose of Study

The objective of this study was to measure the effects of baby sign training on the overall development of a child while improving on the limitations of Kirk, et al. (2013). The research question asked is: What are the effects of parental baby sign training on the overall development of typically developing hearing infants as compared to infants who did not receive baby sign training? The parameters that were analyzed were the communicative, cognitive, social, adaptive and physical development of the infants.

Doherty-Sneddon (2008) states, "communication is at the heart of child development, be it cognitive, social, emotional, or behavioral" (pg. 300). Her rationale suggests that baby sign can be beneficial for infants for communicative reasons. Doherty-Sneddon (2008) advises that researchers need to attain more clinical insight on the effects of baby sign on parent-child communication, and specifically the impact baby sign has on social/emotional environment, communication skills and interactional style.

The present study was conducted primarily in a Hispanic community where majority of individuals speak English and Spanish frequently in their home environment. Moreover, a majority of the population is made of families that come from a low socioeconomic status (SES). This is critical to take into consideration because social class has been found to have an effect on cognitive and language development (Bradly & Corwyn, 2002). It has been demonstrated in a study by Hoff (2003) that children that come from a low SES are not as exposed to language and are spoken to less due to the family dynamics. Bradly and Corwyn (2002) go on further to say that infants have more of a probability of having educational and developmental deficiencies, because caregivers are not exposing their infants to complex grammatical structures and an extensive vocabulary.

Methods

Participants

The participants included 22 infants (twelve females and ten males) whose ages ranged from six to twenty-nine months. Eleven children had parents who participated in a baby sign workshop and 11 children were used as a control group (See Table 1). Mass mailings and flyers were used to recruit participants to take part in the study. Eighteen families participated in the study, and some of the caregivers participated with more than one infant. The infants that took part came from non-homogenous language backgrounds and environments. The infants and their families were either bilingual Spanish/English speaker or monolingual English speakers. The primary language of the bilingual participants at home varied across families. Parents were informed that the language of the home did not have an effect on the ability to use baby sign. For example a sign for "mil" would be the same for both languages.

The infants were all reported to be typically developing by their parents. This was validated by the pre-testing assessments. In addition, participants had not been introduced to sign language with exception of two children (participants 9 and 10 from the experimental group). These two participants had been receiving speech- language service for an expressive language disorder. These two participants who were diagnosed with expressive language delay had been receiving speech-language services. The two participants were exposed to roughly 5 different signs. However, their scores from their pre-test indicated that they were within normal limits for their age. The remaining children in the study were not exposed to baby sign, however several of the mothers in the study were Speech Language Pathologists. A T-test was conducted to test for significant differences in age between the experimental and control groups (Table 2).

Table 1. Gender and age of child participants in the control and experimental groups.

Control Group			Experimental Group		
Participants	Gender	Age at Pre and Post Tests (years:months)	**Participants**	Gender	Age at Pre and Post Tests (years:months)
P1	Female	0:6-0:9	**P1**	Female	0:6–0:9
P2	Female	0:8-0:10	**P2**	Male	0:7–0:11
P3	Female	0:8-0:10	**P3**	Male	0:10–1:14
P4	Male	1:1-1:4	**P4**	Female	0:10–1:0
P5	Male	1:2-1:4	**P5**	Male	1:3–1:5
P6	Female	1:4-1:7	**P6**	Male	1:3–1:6
P7	Male	1:6-1:9	**P7**	Female	1:6–1:9
P8	Male	1:7-1:10	**P8**	Female	1:7–1:10
P9	Female	2:0-2:3	**P9**	Female	2:0–2:3
P10	Male	2:1-2:4	**P10**	Female	2:0–2:3
P11	Female	2:3-2:5	**P11**	Male	2:5–2:7

Table 2. T-Test results comparing ages between experiment and control group.

	Experimental group	Control group
Average	16.09	18.54
T-Test	.44001	

Experimental Design

A between groups design was conducted in order to measure the impact of baby sign on the cognitive, social emotional, adaptive, cognitive, and physical development of infants. Infants from both the experimental and control group were administered twice, the Developmental Assessment of Young Children (DAYC) language battery (Voress & Maddox, 1998). One week prior to the baby sign workshop, the experimental group was administered the pre-test. Six weeks after the baby sign workshop the infants in the experimental group were administered the post-test. For the infants in the control group they were given a pre-test upon availability and

were administered the post-test in an 11 week duration to coincide with the duration of the pre-post test from the infants in experimental group.

Dependent measures

The raw scores that were derived from each participant throughout the pre and post-testing from the DAYC served as the dependent variables. The DAYC measures five developmental areas for young children birth through 4 years of age. These areas are cognition, communication, adaptive behavior, social-emotional behavior, and physical development.

The DAYC was normed on a sample of 1,269 children from 27 states and 1 Canadian province. The sample is representative of the U.S population (as reported by the U.S Bureau of the Census, 1996). The normative sample is representative of the nation as a whole regarding geographic region, gender, race, Hispanic status, and family income and education attainment of paretns. The DAYC protocol conducted to measure the infant's area of development contains high reliability. Content, time, and scorer were three types of test errors viewed during administration. The results indicate that the DAYC holds little test error and that test administrators can rely on the data it provides.

Independent Variable

The independent variable in the present study was the training that was given to the parents during the baby sign workshop. The caregivers were introduced to approximately 200 signs throughout the baby sign workshop, and were taught how to effectively implement the baby signs at home with their infants. Various components were applied during the training of the workshop in order to encourage and facilitate baby sign.

1. At the introduction of the workshop, caregivers received binders and were provided each week with handouts that had an illustration of each sign, the description, a concise explanation of how to produce the sign, and ways to implement the sign at home.
2. Each week a power point presentation was provided to the caregivers that presented signs with an illustration and a label for each sign.
3. After the workshop was concluded, caregivers were provided with a DVD that included a videotape of a certified ASL interpreter illustrating how to execute the signs that were introduced in the workshop.
4. During the workshop food, toys, and books were utilized to train the various ways the caregivers could apply the signs at home to accommodate for their daily schedules.

Setting

The baby sign workshop was held in the University of Texas at El Paso Speech-Language Pathology clinic. In the first meeting, the caregivers were instructed in a typical classroom setting where seating arrangements were in rows facing directly to the researchers. In the following meetings, the room was altered so that the seating arrangements were in an arena surrounding a rug in the middle of the floor. This modification provided parents more social interactions and parent-child contact. Furthermore, the researchers discovered that this modification made it more manageable to aid caregivers in implementing appropriate sign production. The administration of the DAYC was conducted at the University of Texas at El Paso Speech-Language Pathology clinic or the infant's home for both the experimental and control groups.

Procedure

The Institutional Review Board at the University of Texas El Paso reviewed the study protocol. One week preceding the Baby Sign Workshop, the experimental group was administered the DAYC. The participants in the control group were administered the DAYC upon availability. The scoring for both groups was obtained through observation, interview or direct assessment of the infant by the examiner.

The caregiver and their children attended a five-week baby sign workshop where they met once a week for two hours. The workshop was divided in to two portions: the review session and the executing portion. For the first 30-45 minutes of each meeting, the caregivers met with the primary researchers to go over the introduced signs. While the meeting took place, the infants of the caregivers were cared for by research assistants. The signs were taught primarily by a certified ASL interpreter in every class. Other researchers assisted caregivers on how to properly execute the introduced signs and how to implement them.

During the first section of the workshop, caregivers were introduced to the signs with a power point presentation for verification. The researchers gave a demonstration of each sign introduced and verified whether the caregiver could correctly produce the sign. The caregivers were then evaluated on their expressive and receptive understanding of the signs for verification. The infants then joined their parents for the second half of the session so that the caregivers could practice implementing the signs. The researcher would help the parents during this time with any corrections or comments regarding how the caregivers were producing the signs.

Upon arrival of the first day of the workshop, the caregivers were provided with a lecture of the background and significance of baby sign and claimed benefits. Researcher then provided the caregivers with an outline of how the workshop was going to function and gave brief

background information on history with ASL and use with children. Lastly, caregivers were given time to ask questions or concerns about the study.

For the duration of the workshop, the researcher asked the caregivers for their personal opinions and questions regarding the study, which were then addressed in great detail. Furthermore, the researchers motivated caregivers to choose signs that could be incorporated in their day-to-day schedules and signs that they believed would be convenient and significant to their family to develop well parent-child interactions. Researcher would assess previously taught signs every week to ensure proper that the parents were producing and implementing the signs correctly.

The five weeks training were divided into specific themes. The themes that were implemented in the training included: week 1-family members and greetings, week 2- food items and related verbs, week 3-toys and animals, week 4- emotions and routines, week 5-miscellaneous. Approximately 200 ASL signs were introduced to caregivers and their infants. The signs were selected by researchers based on standard first word/gestures that are commonly used both by oral language and ASL (Anderson & Reilly, 2002). The parent requested seventy-four miscellaneous ASL signs.

The experimental group was administered the post-test six weeks after the baby sign training was conducted and the control group was administered the DAYC eleven weeks after the pre-test was administered to correspond with the experimental group. The data from the evaluations were then gathered to analyze and compare post-test scores between groups.

Statistical Analysis

The A Mann-Whitney U test was used to analyze any significant differences between post-test raw scores on each of the five subtests between the experimental and control groups. Due to the small sample size this non-parametric analysis was selected.

Inter-rater Reliability

The experimental and control groups were recorded during the administration of the DAYC and thirty percent of the evaluations were re-scored by another rater. The second raters were master's students in the Speech Language Pathology program who were instructed on how to deliver the assessment. Point to point agreements between raters was 95% for each testing group. Complications were exhibited when the videos were reviewed. As a result of camera positioning, poor infant visibility caused difficulties for the second rater, resulting in the percentage obtained.

Results

Table 3 displays a detailed overview of the data for the infant's pre-test and posttest raw scored derived from the five DAYC subtests for both the experimental and control group.

The averages for the pre-test raw scores across the six subtests for the infants in the experimental group are as follows: physical development (*M* = 47.53, *SD* = 13.38), fine motor development (*M* = 8.18, *SD* = 3.12), social-emotional development (*M* = 24.18, *SD* = 8.09), communication development (*M* = 29.64, *SD* = 12.41), cognitive development (*M* = 21.27, *SD* = 7.70), and adaptive behavior development (*M* = 20.54, *SD* = 8.00).

The averages for the pre-test raw scores across the six subtests for the infants in the control group are as follows: physical development (*M* =43.90, *SD* = 13.38), fine motor development (*M* =8.18, *SD* =2.96), social-emotional development (*M* =24.90, *SD* =8.53), communication development (*M* =28.27, *SD* =12.11), cognitive development (*M* =21.90, *SD* =7.84), and adaptive behavior development (*M* =20.81, *SD* =9.04).

The averages for the post-test raw scores across the six subtests for the infants in the experimental group are as follows: physical development (*M* = 56.72, *SD* = 13.49), fine motor development (*M* = 14.81, *SD* = 2.22), social-emotional development (*M* = 33.27, *SD* = 8.05), communication development (*M* = 37.18, *SD* = 11.4), cognitive development (*M* = 31.72, *SD* = 8.16), and adaptive behavior development (*M* = 29.27, *SD* =9.42).

The averages for the post-test raw scores across the six subtests for the infants in the control group are as follows: physical development (*M* =45.72, *SD* =13.55), fine motor development (*M* =9.18, *SD* =3.47), social-emotional development (*M* =26, *SD*=8.76), communication development (*M* =29.36, *SD* =12.15), cognitive development (*M* =23.18, *SD* =6.76), and adaptive behavior development (*M* =22.63, *SD* =8.81).

Table 3. Descriptive statistics and percentiles for typically developing hearing infants on pre- test and post-test DAYC subtests for both experimental and control group.

DAYC Subtest	Pre test		Post test	
Experimental Group				
Communication	M	SD	M	SD
Cognition	29.64	12.41	37.18	11.4
Social emotional	21.27	7.7	31.72	8.16
Adaptive behavior	24.18	8.09	33.27	8.05
Physical	47.53	13.38	56.72	13.49
Control Group				
Communication	28.27	12.11	29.36	12.15
Cognition	21.9	7.84	23.18	6.76
Social emotional	24.9	8.53	26	8.76
Adaptive behavior	20.81	9.04	22.63	8.81
Physical	43.9	13.38	45.72	13.55

The A Mann-Whitney U test was conducted to compare the pretest scores of the DAYC between the control and experimental group. There were no significant differences found in the pre test scores between groups. (Table 4)

Figures 1 through 5 demonstrate the individual posttest scores of each infant on the communicative, cognitive, social, adaptive behavior and physical development subtests for both the experimental and control group.

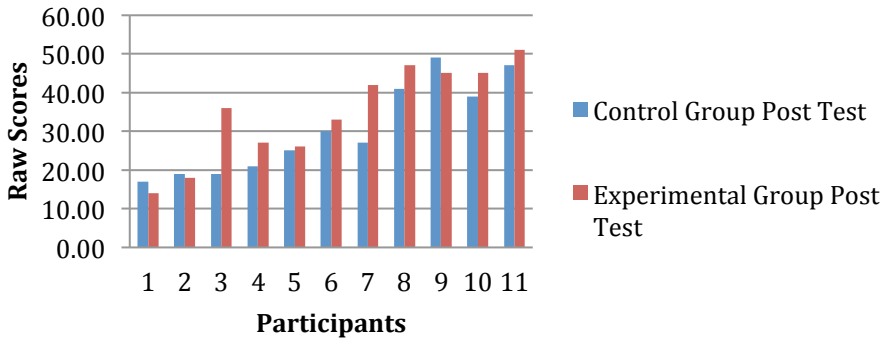


Figure 1.1 Post-test scores on the communication development subtest of the DAYC between experimental and control groups.

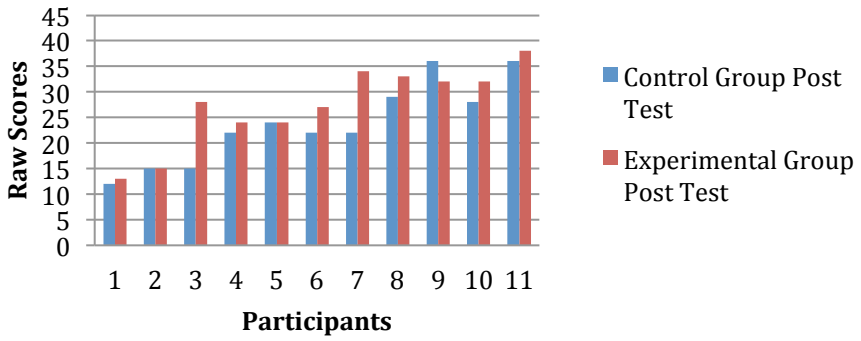
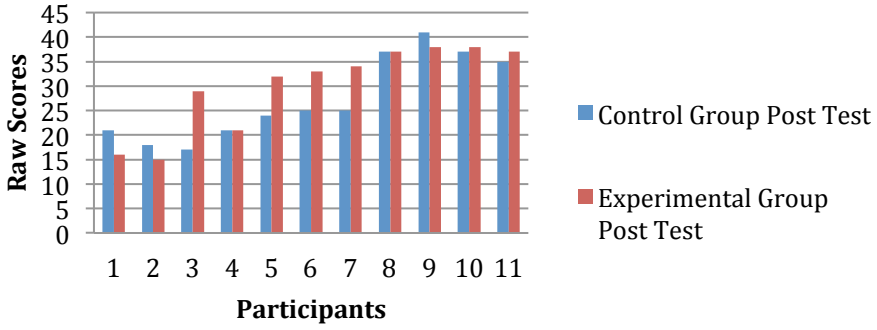


Figure 2.1 Post-test scores on the cognitive development subtest of the DAYC between experimental and control groups.



Figures 3.1 Post-test scores on the social development subtest of the DAYC between experimental and control groups.

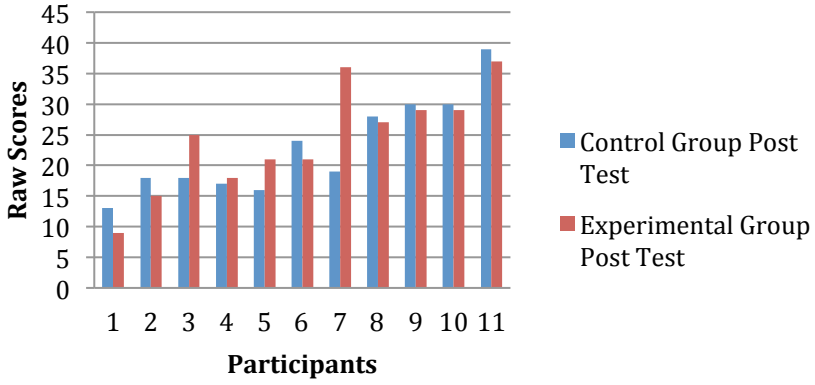


Figure 4.1 Post-test scores on the adaptive behavior development subtest of the DAYC between experimental and control groups.

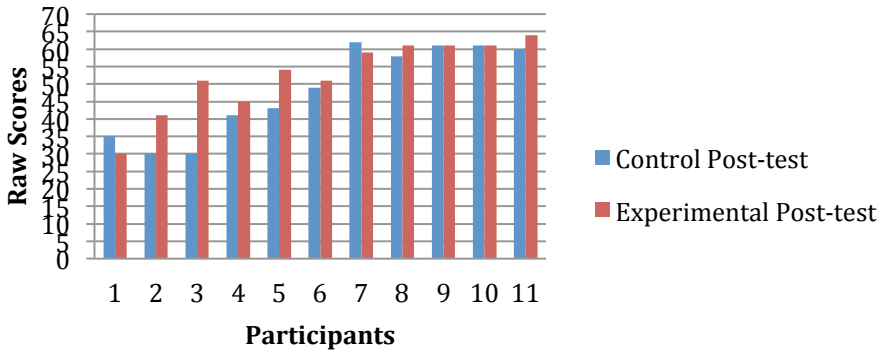


Figure 5.1 Post-test scores on the physical development subtest of the DAYC between experimental and control groups.

A Mann-Whitney U test was implemented on post-test raw scores on each of the DAYC subtests for both groups of the study. A comparison of mean scores revealed no differences

between conditions; child development of infants whose parents had baby sign training were no different than those whose parents had not participated in the baby sign training (See Table 3). There were no significant main effects in all 5 subtests; physical development (Z = -2.81, p = .458), social development (Z = -.561, p = 0.606[b]), communication development (Z = -.822, p = .438), cognitive development (Z = -1.121, p = .270), and adaptive behavior development (Z = 0.898, p = .688).

The participants in both the control and experimental group demonstrated improvement between pre- and posttest scores across all areas of child development. These findings indicated that there was no significant difference between the post-test scores in both the experimental and control group, meaning, that the Baby Signing Workshop had no influence on social, adaptive behavior, cognitive, communication and physical development.

Table 4. Mann-Whitney U Test Results

Subtest	Pre-test (Z)	Post-test (*Z*)	Pre-test (*p*)	Post-test (*p*)
Communication	.000	-.822	1.000[b]	0.438[b]
Cognition	-.033	-1.121	1.000[b]	0.270[b]
Social-Emotional	-.164	-.561	0.898[b]	0.606[b]
Adaptive Behavior	-1.64[b]	-.428	0.898[b]	0.688[b]
Physical	-.304	-2.236	0.374	0.458[b]

Discussion

The current study's main objective was to examine and evaluate the effect of the baby sign training on the physical, cognitive, communicative, adaptive behavior, and social development of infants. The specific research question for this study was: What are the effects of parental baby sign training on the overall development of typically developing hearing infants as compared to infants who do not receive baby sign training? The data that was gathered in the study demonstrates that the parent baby sign training did not have an impact on the infants' development in communication, cognitive, social, adaptive behavior, and physical competence as measured by the DAYC. The infants whose parents did not attend the workshop exhibited as much as an improvement in all five subtests as the participants who attended the baby sign workshop.

The findings of this study complements the conclusions found by Kirk et al. (2013). The authors did not find any support that baby sign had an impact on infant development. The current study improved on some of the limitations by Kirk et al. (2013).

Firstly, the way the current study and the study done by Kirk et al. (2013) trained the caregivers on sign implementation were very different. In the current study the caregivers were introduced to approximately 200 signs where as in the Kirk at al. (2013) the caregivers were introduced to 20 signs. Due to the additional signs, caregivers had the opportunity to implement the signs they believed were more practical for their daily routines, and parent perceived needs. In the present study, the researchers committed an immense amount of time to the baby sign training and suggestions on implementation. In contrast, the caregivers in the Kirk et al. study did not have extensive training and were only provided with a workbook with illustrations of the 20 signs with no direct help regarding home implementation. The caregivers in the present study

had a two-hour long course once a week for five weeks, where they had the opportunity to carry out suggestions regarding the production of signs and implementation with their infants. In the current study researchers immediately corrected or assisted caregivers that would make errors in implementation such as keeping an item from their infant until they execute the requested sign.

In addition, during the course of our workshop, the researchers addressed any difficulty or question in regards to the introduced signs and implementation. The parents were surrounded by encouraging researchers who devoted their time to supplying the caregivers with suggestions on how to implement the signs without pressure and under everyday conditions. Following the workshop, caregivers informed the researchers that their infants had increased communication skills, reinforced parent-child communication, and infants did not present signs of frustration. Furthermore, the caregivers reported the baby sign workshop was pleasurable as they were able to connect and communicate with other parents in a learning environment (for further insight of impressions by caregivers for the duration of the training see Mueller and Sepulveda (2013)).

In addition, the way both studies recruited infants and their families were exceedingly distinct. In the Kirk et al. study the participants were neither informed nor interested in baby sign where as in the current study they willingly participated to attend and learn baby sign. In the current study, the caregivers were not asked how many times a day during the week they implemented the signs. The researchers were informed by the parents that they consistently implemented the signs throughout the day. Because, there was no record of how often the caregivers implemented the signs to their children, this could have negatively influenced the results.

Lastly, a factor that could have impacted the results was the measurement of the assessment that was given to the infants. The DAYC analyzed the areas of communicative,

cognitive, social, adaptive behavior, and physical development. The assessment could have been too broad of a measure to analyze any improvements that the infants may have had. The effects on keen differences on the infant's communicative, cognitive, and social development can be crucial to observing any significant growth. Kirk et al. (2013) found that mothers who received the baby sign training were more receptive towards their infant's non-verbal cues and motivated independence.

Limitations

This study is not without its limitations. Firstly, the sample size of the study was small consisted of only 11 participants for both the experimental and control group. Therefore, any data suggests little generalization to the general public or an individual. The infants who participated in the study ranged from 6 months to 2 years 5 months making it difficult to interpret the data. Therefore, future research should include more homogenous samples so that the interpretations of the results are clearer. In addition, participants were recruited by availability and convenience and were not randomly assigned. Furthermore, because caregivers did not track how often they implemented baby sign at home, it is unclear how effective families were at implementing baby sign with their child. In addition, self-report bias could have been a factor on the results of the current study. During administration of the DAYC, the parent's judgment on their child's development was accounted for when the child did not demonstrate the skill needed for scoring. This notion could have a significant influence on the data of both the experimental and control group. As discussed the DAYC may have been too broad of measure to analyze any significant growth. Implementing a different assessment to examine any subtle differences could be beneficial when analyzing the impact of baby sign.

Future Considerations

Future empirical studies should take including larger sample sizes with homogenous samples. It is necessary to include parental training that is extensive and more randomized control trials. In addition, more focus needs to be made in measuring the subtle differences on the effects of baby sign on parent and child interactions, which were reported to increase in Kirk, et all (2013). The authors reported that mothers who participated and implemented baby sign were more receptive to their infant's non-verbal cues and motivated independence. Having found little evidence on any impact of baby sign on child development, we take into consideration the possibility that baby signs may have changed the caregiver-infant interaction process and this might be identified upon closer investigation.

A limited amount of research has devoted time to analyzing the impact of baby sign and has focused on promoting or disclaiming the claimed benefits. Furthermore, empirical studies should analyze the impact of baby sign on language development with children who manifest with language deficiencies. Kirk, Pine, and Ryder (2010) state that children who exhibit language deficiencies comprehend oral communication when it co-occurs with gesturing. Future research should differentiate between children with low and high language skills before implementation. This area of research seems necessary in analyzing the impact of baby sign on language ability. Kirk et al (2013) states that children who are raised in low linguistic environments may benefit from enhanced gesturing.

Although, the current study's baby sign training differentiated considerably from that delivered to the parents in Kirk et al. (2013) study, more empirical investigation needs to be conducted related to how sufficiently train parents on baby sign. Further research is needed in assessing the comparison among a parenting class and baby sign class. Lastly, further research

needs to be conducted to the analyze the effects of baby sign training, on parental stress, child/parent interactions, baby sign benefits, and child development.

Conclusion

The data between the experimental and control groups of the current study do not support baby sign training for caregivers. Further empirical researcher is needed to base conclusions on the impact of baby sign. Professionals can only offer their own opinion towards baby sign, its use, and the impact on child development. In order to make the best use of baby sign and its potential benefits, researchers need to analyze the effects of baby sign use.

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Curriculum Vita

Bethany Urquidi was born in El Paso, Texas. The daughter of George Urquidi and Irma Urquidi, she graduated from Americas High School, El Paso Texas, in the spring of 2009 and entered El Paso Community College (EPCC) in the fall. While completing her core classes at EPCC she worked at The Corner Bakery Café for two years until she transferred to the University of Texas at El Paso to begin her prerequisites for the Speech-Language Pathology program. She joined the distinguished National Student Speech Language Hearing Association and has been involved with the club for the past four years. During her undergraduate courses she shadowed Speech-Language Pathologists around her community and immersed herself in the world of Speech Language Pathology. At this time she assisted a Speech Language Pathologist in her after school sign language club. This influenced Bethany's interest in sign language and child development. In the fall of 2013, she entered the Graduate School at The University of Texas at El Paso where she will complete the 5-year plan to receive her Master of Science Degree in Speech-Language Pathology.

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