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The Efficacy of Baby Sign Language in Reducing Problem Behaviors in Typically Developing Children

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TYPICALLY DEVELOPING CHILDREN

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by

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Abstract

Baby sign is an emerging trend that is speculated to reduce the instances of tantrums, emotional outbursts, and frustration in typically hearing infants (Nelson, White, & Grewe, 2012). Despite its proclaimed benefits, little research has been conducted to evaluate the true efficacy of baby sign in reducing problem behaviors in typically hearing children. The purpose of this study was to evaluate whether or not baby sign could be used as an alternative and augmentative communication modality in increasing communicative intent and decreasing stress. A single subject, AB design was used to examine the changes in behavior in a typically developing child 11 months of age. The researchers introduced baby sign to the participant using an adapted version of the milieu language teaching procedure (MT) and recorded the number of problem behaviors exhibited during baseline and treatment sessions. Sessions were video-recorded to obtain inter-rater reliability and percentage of non-overlapping data was calculated to determine overall efficacy. Results showed that the treatment using baby sign was effective in reducing problem behaviors by 50% percent. These findings have implications for the positive effects of baby sign use in typically developing populations.

Keywords: problem behaviors, baby sign, language acquisition, infants, intervention, alternative and augmentative communication, milieu language teaching, Autism Spectrum Disorders, communicative development, distress

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Chapter 1: Literature Review

Baby sign is referred to as a typically hearing infant's usage of keyword signs to increase communication with adults in their lives (Doherty-Sneddon, 2008). Keyword signing involves the use of content words in language with the subsequent removal of function words. For example, a mother who is using baby sign with her infant may use only the signs for WANT and MILK in the sentence, "Do you want more milk?" In teaching baby sign, parents often incorporate signs for toys, actions, and requests that are most desirable and functional for the infant (Mueller & Acosta, 2015). Signs are generally produced in conjunction with spoken words and produced numerous times in various contexts before expected generalization.

It is important to note that baby sign differs from American Sign Language (ASL), the predominant language of the deaf and hard-of-hearing community in North America. ASL is a complex language system that contains its own set of syntactical, semantic, and prosodic features. People who use ASL often employ facial expressions and postures to highlight intent and meaning. ASL is also subject to regional variances, as signs, prosody, and formation may differ according to various location in the United States.

Baby sign also differs from ASL in that baby sign can be used simultaneously with any spoken language as grammar and syntax in baby sign are ignored. As stated previously, ASL is its own language which includes all domains of language such as phonology, semantics, morphology, syntax, and pragmatics. For example, an individual that speaks Mandarin can use keyword signing while stating the name of the object in Mandarin. However, a deaf individual in China will most likely use Chinese Sign Language instead of ASL. Furthermore, baby sign typically involves the adaptation and simplification of ASL for ease of sign formation and mastery.

Although there is limited research to validate the true efficacy of baby sign, its benefits have been highly sensationalized by various media outlets and child care centers. It has been directly publicized on frequently read newspapers such as the *New York Times* and the *Washington Post* as well as on television (Berck, 2004; Glazer, 2001). Baby sign is speculated to promote language development, improve literacy, increase cognitive skills, and reduce the instances of tantrums, emotional outbursts, and frustration in infants (Nelson, White, & Grewe, 2012). It also is stated to improve overall parent-child relationships (Acredolo, Goodwyn, & Abrams, 2002).

As it relates to the current study, the literature supporting the advantages of baby sign on communicative development remains inconclusive (Fitzpatrick, Thibert, Grandpierre, & Johnston, 2014). Nelson et al (2012) conducted a thorough examination of 82 sources cited by 33 different websites that advocated for baby sign use. Results showed that only 8 of the 82 articles cited were derived through empirical means, and the remaining 90% were gathered from opinion. This indicates a need to expand on the literature and overall knowledge that practitioners have regarding baby sign.

1.1   *Gesture and Language Development*

Although there is limited research on baby sign, there is extensive literature on gesture use and development in typically developing populations. This is important and has bearing as baby signs are considered gestures. Prior to language acquisition, infants use gestures to convey wants and needs within their environment. This form of intentional communication typically emerges between nine to twelve months of age (Bates, Benigni, Bretherton, Camaioni, & Volterra, 1979). Iverson and Thal (1998) defined gestures as being deictic or representational.

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Deictic gestures call attention to a desired item and consist of, but are not limited to pointing, giving, reaching, extending a hand out to initiate help, and various facial expressions (Iverson et al., 1998). These gestures need to be observed in context to establish a relationship to the item or specific action desired. Representational gestures, on the other hand, contain semantic content and establish a clear relationship to the item, action, or emotion (Iverson et al., 1998). Examples of these types of gestures include, but are not limited to, specific baby signs, shaking head to state no, waving goodbye, and placing hands on lips to blow a kiss.

The gestures produced during this stage of development help to facilitate language formation. Iverson and Goldin-Meadow (2005) discovered that gestures made in reference to a specific item were later used in the child's communicative repertoire. Furthermore, children that produced gestures in conjunction with a word were among the first to produce two word utterances (Iverson et al., 2005). The evidence behind gesture production may play a key role in contradicting prior beliefs that signing halts verbal output. Rather, representational or symbolic gestures may serve to augment communication. Iverson, Capirci, Longobardi, and Caselli (1999) additionally discovered preliminary benefits to the impact that parental gestures have on the child's overall development of gesture and, eventually speech.

1.2 *Sign Use in Typically Hearing Populations*

In typically developing populations, the decision to use sign prior to verbal development stems from the desire to provide clarity during parent-child interactions (Pizer, Walters, & Meier, 2007). Baby sign serves as a way for parents to teach their children how to use language through appropriate means such as requests, politeness markers, labels, and displays of knowledge (Pizer, 2004). In a longitudinal study conducted by Goodwyn, Acredolo, and Brown (2002), children

between the ages of eleven and thirty-six months who were taught baby sign performed better on receptive and expressive language assessments when compared to infants that were not exposed to symbolic gestures. Results from this study provide promising implications to how baby sign may be useful in enhancing communicative development.

Recent research conducted by Mueller, Sepulveda, and Rodriguez (2014) showed that baby sign had a positive effect on the development of communication, cognitive, social, adaptive behavior, physical, and fine motor skills in infants. In this study, Mueller and colleagues examined 11 infants between 6-29 months from a predominantly Latino population with a lower socioeconomic status. They hosted a 5-week long baby sign workshop once a week for 2 hours and taught parents approximately 200 signs. The signs were displayed in PowerPoint presentations and compiled into binders with still images for the parents to continue practice at home. The evaluators administered the DAYC language battery one week prior to the workshop and six weeks following the workshop to observe any changes as a result of the implementation of baby sign. The results support the idea that baby sign has the potential to improve social and communicative development, which may alleviate communication barriers that result in common problem behaviors.

Dayanim and Namy (2015) additionally conducted a study to measure an infant's ability to learn and retain baby sign. 92 typically developing infants without prior exposure to baby sign were recruited for the experiment and randomly assigned to one of the four following conditions: individual video viewing, viewing with a parent, a parent instruction condition, and a no-sign exposure condition. Results showed that children that were exposed to sign regardless of condition (through video or parent instruction) were able to produce and retain the sign with only

20 minutes of exposure, four days a week, over a total of three weeks. This supports the idea that the learning and retention of baby sign is a feasible task for the target population selected for this study. Sign also has the potential to benefit children at risk for language delay or disorder as evidenced by improvements in the expressive score of boys with low language abilities (Kirk, Howlett, Pine, & Fletcher, 2013).

1.3   *Augmentative and Alternative Communication in Autism Spectrum Disorders*

Both sign language and the picture exchange communication systems (PECS) are forms of augmentative and alternative communication (AAC). Miller (1984) proposed that sign language may be used as an alternative communication method to decrease aversive behavior in verbal children that are identified as behavior disordered. Lloyd and Karlan (1984) additionally outlined reasons why manual sign may be an appropriate intervention method for children with Autism Spectrum Disorders. They stated that manual sign reduces the physical demands and psychological pressure of verbal output, minimizes the auditory processing requirements necessary for speech, and provides a simplified visual representation of the language that remains engaging and functional for the individual involved (Lloyd & Karlan, 1984). In one study, three children who were diagnosed with ASD were able to acquire and generalize signs following a keyword signing intervention strategy (Tan, Trembath, Bloomberg, Iacano, & Caithness, 2014). Results were also associated with positive changes in gesture and spoken word production (Tan et al., 2014). The findings highlighted some key components such as the importance of using sign in combination with speech and the role that attention has on intervention outcomes (Tan et al., 2014).

Habarad (2015) incorporated the use of sign as a secondary method of communication for a 12-year old boy with Autism (Habarad, 2015). His primary mode of communication was a form of augmentative and alternative communication that utilized images instead of words to communicate, otherwise known as the picture exchange communication system (PECS). In the study, the participant received one-on-one Applied Behavior Analysis (ABA) therapy to improve his ability to request for items and decrease self-injurious behaviors that occurred as a result of limited verbal output. Results demonstrated that the participant was able to significantly reduce self-injurious behaviors and develop a manding repertoire. These findings additionally indicated that adaptive sign language could be an effective alternative communication method (Habarad, 2015).

Although the literature involving sign in children with ASD is scarce, the picture exchange communication system (PECS) has been more thoroughly examined. In a study that examined 3 boys diagnosed with autism, the PECS system was effective in reducing disruptive behaviors in which previous verbal speech training had been ineffective (Charlop-Christy, Carpenter, Le, LeBlanc, & Kellet, 2002). The PECS system was also effective in decreasing the frequency and duration of screaming in a 10-year old participant with severe autism (DeLeon, & Pelaez, 2013). Both studies reported above supports the idea that an alternative form of communication can be used to decrease tantrums in children that have little to no verbal output.

1.4   *Milieu Language Teaching*

Generalization of skills taught during intervention are better maintained when modeling is performed naturalistically (Charlop-Christy et al., 2000). Milieu language teaching (MT) is a child-centered intervention approach that is aimed to enhance social/communicative interactions

in the child's most natural environment (Kaiser, 1993). The procedure utilizes a hierarchical structure to enhance language complexity as the child's comprehension and communicative intention increases. It involves child-cued modeling, mand-modeling, time delay, and incidental teaching (Parker-McGowan, Chen, Reichle, Pandit, Johnson, & Kreibich, 2014). Various studies have illustrated milieu teaching as an efficacious method for increasing communication for children with limited speech or language delays. For example, Franco, Davis, and Davis (2013) found that milieu teaching strategies enhanced child-initiated communication acts and conversational maintenance in six participants with Autism. A systematic review of the literature found that this naturalistic method promoted generalization in 94% of the studies examined as compared to trainer-directed approaches (Peterson, 2004). Peterson (2004) also found that this particular approach was most beneficial for children who came from low-income families, children with language delays, and children from at-risk families. This source is of particular importance to the present study as it was conducted in a predominantly Latino community, where a majority of the population belongs to a lower socioeconomic bracket.

Systematic investigation has also led to the question of whether dosage frequency and cumulative intervention intensity has an effect on the collateral efforts of MT. 311 studies were extracted from eight electronic databases to examine how dosage plays a role in the efficacy of MT. Results showed that only 37.8% of the studies provided a clear definition of treatment intensity and reported the full range of dosage parameters (Parker-McGowan et al., 2014). In another study, Julien and Reichle (2016) discovered that individual characteristics play a significant role in terms of how low and high dosage frequencies affect responses to intervention.

1.5   *Purpose of Study*

The present study aims to add to the existing body of literature on the efficacy of baby sign language, a branch of research in which there is a lack of empirical evidence. Previous research studies have indicated that baby sign can be used to foster communicative development. Prior to spoken language acquisition, a child's inability to communicate needs and desires may lead to frustration and various problem behaviors. The acquisition and facilitation of baby sign in lieu of verbal output is hypothesized to reduce problem behaviors in children. Investigating how baby sign affects problem behaviors in typically developing children can additionally provide a framework that can be compared to the efficacy of baby sign as an alternative and augmentative communication method in special populations (e.g. children with Autism). The research question asked was, "Will increased use of baby sign in a typically developing child reduce problem behaviors?"

Chapter 2: Methods

2.1   Participant

The study participant included an 11-month old female (L.R) that was recruited through advertisement at the University of Texas at El Paso. An initial interview was set up to determine eligibility for the study as well as obtain medical case history, review L.R's typical behavioral patterns, explain the study, and have the parents sign the consent forms. The interview portion revealed that L.R was exposed to English and Spanish in her home environment. She was born at 37 weeks and was diagnosed with malrotation of the intestine and volvulus, which required surgical intervention following birth. However, she had not been hospitalized for any serious injuries or illnesses afterwards. The family also reported two cases of autism spectrum disorders on the mother's side. L.R met inclusionary criteria because she did not present with intellectual, cognitive, or sensory deficits. L.R's parents additionally completed the Ages and Stages Questionnaire (ASQ), a 10-15-minute assessment that examines communication, gross motor, fine motor, problem solving, and personal-social development in children between one month to 5 ½ years of age (Squires & Bricker, 2009). The 10 month ASQ was chosen to verify that developmental milestones were achieved within a typical timeframe. Subsequent scores of 10 (yes), 5 (sometimes), and 0 (not yet) were given for each answer provided. The participant scored 60 for communication, 55 for gross motor, 60 for fine motor, 45 for problem solving, and 50 for personal-social. Scores for each subsection indicated typical development.

L.R typically communicated wants and needs through non-symbolic gestures and vocalizations (i.e. eye gaze, reaching, babbling, extending object to conversational partner, etc). She demonstrated appropriate eye contact and spontaneous vocalizations during play. Problem behaviors were most commonly associated with an inability to obtain desired items and

presentation of non-preferred tasks. Resultant behaviors included crying, hitting, throwing, grabbing, and moving arms up and down in frustration.

2.2   *Setting*

Play sessions were conducted at the University of Texas at El Paso Speech, Hearing, and Language Clinic, with one treatment session conducted in the participant's home. This setting was ultimately chosen to provide a self-contained classroom in which the participant could explore, while limiting distractions that may occur in the home environment. A video-recorder was placed in view, out of reach of the participant. Clinic rooms were well-lit to ensure adequate image results for data collection and inter-rater reliability measures following each session.

2.3   *Design*

The examiners originally sought to conduct a multiple baseline design across participants. Due to time needed to observe measurable changes in each participant, this design did not end up being feasible for the subsequent time constraints. Instead, an AB design was utilized to assess the effects that baby sign training had on reducing challenging behaviors in a single participant. Visual inspection of the data collected from the baseline and treatment sessions was used to determine treatment efficacy and percentage of non-overlapping data was used to determine effect size (Scruggs & Mastropieri, 1998). The criteria was set at a 50% reduction in problem behaviors observed over three consecutive sessions below baseline. Alternatively, plateau would be reached if a 50% increase was observed in problem behaviors over 5 consecutive sessions. Had the participant reached her plateau, the researcher would have terminated treatment.

The dependent variable in the study was the use of adapted MT with baby sign and speech as the mode of communication. The independent variable was the number of problem behaviors observed. See Table 1 below for the operation definitions of the problem behaviors.

2.4   Procedures

Baseline

The researcher conducted 20-minute play sessions in the clinic using an adapted MT procedure and highly desired toys that were identified during the initial screening process. During play routines, the examiner utilized items that the child would need assistance from an adult to reach, open or repair. The researcher interacted naturally without using baby sign or prompts to cue the child. Neutral comments such as "Oh, I see" were utilized during these sessions. The researcher waited a total of three seconds for the child to request an object using any form of communication, such as vocalizations, signs, or verbal approximations before giving her access to the item. If the child exhibited a problem behavior, the toy or item was immediately given to the child to prevent the behavior from escalating.

Baby Sign / Milieu Teaching Treatment

The treatment phase consisted of 20-minute sessions that were conducted in the clinic room. The researcher followed the lead of the child during these play routines and provided modeling cues for tangible items and requests. For example, if the child wanted a ball, the researcher would state "that's a ball" and produce the sign BALL. The researcher modeled each target sign a total of 10 times and provided hand-over-hand assistance at least 5 times. After this step had been achieved, the researcher provided prompts (e.g. what do you want?) to encourage facilitations of signs. Preferred items were placed in sight, with some out of reach of the

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participant. Different items were introduced that required adult assistance to open or repair. The examiner waited a total of three seconds for the child to produce the appropriate sign or verbal approximation before allowing access to the item. If the child exhibited a problem behavior, the examiner stated the word, provided hand-over-hand assistance for its sign, and gave the child the item. Baby sign treatment was conducted approximately two to three times per week, depending on the parent's schedule until mastery of criteria was achieved (50% reduction in problem behaviors over 3 consecutive sessions). The parents also reported continued practice of signs learned at home.

Recording and Addressing Problem Behaviors

For both baseline and treatment sessions, the process of recording problem behaviors was the same. The examiner first provided a description of the behavior at the time that it was observed. These behaviors were then grouped into one of the following categories based on the operational definitions listed: aggression, grabbing behaviors, and tantrums (See Table 2.1). It is important to note that problem behaviors were recorded based on frequency and not on severity. Although the purpose of the study was to examine the number of problem behaviors prior to and following baby sign treatment, the greatest care and caution was taken by the examiner to ensure that there was no undue stress on the child. By providing the desired item within a set time frame, the researcher ensured that the problem behavior only lasted one to two seconds in duration. The examiner also recorded the number of non-symbolic (i.e. reaching, giving, extending a hand out, vocalizations) and symbolic gestures/word approximations (i.e. sign approximations, shaking head) across sessions (Iverson et al., 1998).

Inter-rater Reliability

During the baby-training phase, all sessions were recorded for training, analysis of treatment fidelity, and inter-rater reliability purposes. Twenty-three percent of the sessions were analyzed and scored by another individual. The second rater was an undergraduate student in the speech-language pathology program. The examiner trained the rater on three randomly selected videos to ensure understanding of proper recording protocol. The examiner then assigned three videos to the rater and provided her with the operational definitions for each behavior that was being analyzed (See Table 2.1). The inter-rater reliability was 90% for this study. This percentage was calculated by dividing the total number of agreements between the raters from the sum of total agreements and disagreements, and then multiplying by 100% (Scruggs et al., 1998). Discrepancies in these percentages may have resulted from the angle of the child in relation to the camera. At times, the participant would face away from the camera, which may have made visualization of certain problem behaviors more difficult to observe. In other instances, the child exhibited a variant of the behavior to convey excitement. The reason for the behavior would have to be derived contextually, which may have been more difficult for the rater to code since she was not present in the session. For example, one of the behaviors listed under tantrums included "bouncing up and down in frustration." L.R would often bounce up and down in excitement when she received a toy that she enjoyed (i.e. playing with bubbles) which may have been confused for problem behavior.

Table 2.1 Operational Definitions and Measurements of Problem Behaviors in Play Settings

| Behavior	Measure	Operational Definition
Tantrums	Frequency	-Crying. -Screaming/Yelling. -Bouncing up and down in frustration. -Moving/hitting arms and legs in frustration. -Lying on the floor when it is not part of the activity. -Whining-variations in pitch.
Grabbing	Frequency	-Taking an object away from a person without asking. -pulling another person's hair
Aggression	Frequency	-Throwing/banging objects. -Destroying objects. -Kicking/hitting an object, wall, floor, or person. -Knocking/swiping objects off of a table -spitting -biting
Impolite commands	Frequency	-commands marked with a change in intonation (e.g. "give it to me, stop it, don't do that."

Chapter 3: Results

Reduction in problem behaviors

The total number of problem behaviors were recorded and compiled into a graph for visual inspection (See Figure 3.1). L.R. exhibited 36, 40 and 38 problem behaviors, respectively, during the initial baseline sessions, sustaining an overall average of 38. Problem behaviors were characterized by crying, screaming, throwing objects, shoving toys away, hitting a person/toy, and taking an object from someone else without asking. Behaviors were perpetuated by an inability to obtain or operate a desired item. For example, the participant would often hit a toy in an attempt to turn it on or get frustrated when the same stimulus item was presented to her after wanting to move on to another object. After assessing preliminary sessions, the examiners divided the average baseline behaviors in half to establish mastery criteria. The researcher calculated that the criteria to have reduced behaviors by 50% would be less than 19 problem behaviors across three consecutive sessions.

L.R achieved criteria after 10 sessions of baby sign treatment, with 9 of the 10 showing a reduction from the lowest baseline point achieved. During treatment 1, L.R exhibited 32 problem behaviors. Treatment 2 was the only session that the participant displayed more behaviors (49) than those recorded during baseline. Following this session, there was a steep decline in which the problem behaviors fell to 19 for two consecutive sessions. Had the participant displayed 19 or less behaviors in the following session, she would have met criteria. However, behaviors increased by two resulting in 21 behaviors observed for treatment 5. L.R dropped to 16 for treatment 6 and increased to 28 for treatment 7. During the last three sessions of baby sign treatment (treatments 8, 9 and 10), L.R displayed 7, 13, and 16 problem behaviors respectively.

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Percentage of non-overlapping data was computed at 90%, indicating a moderately effective treatment.
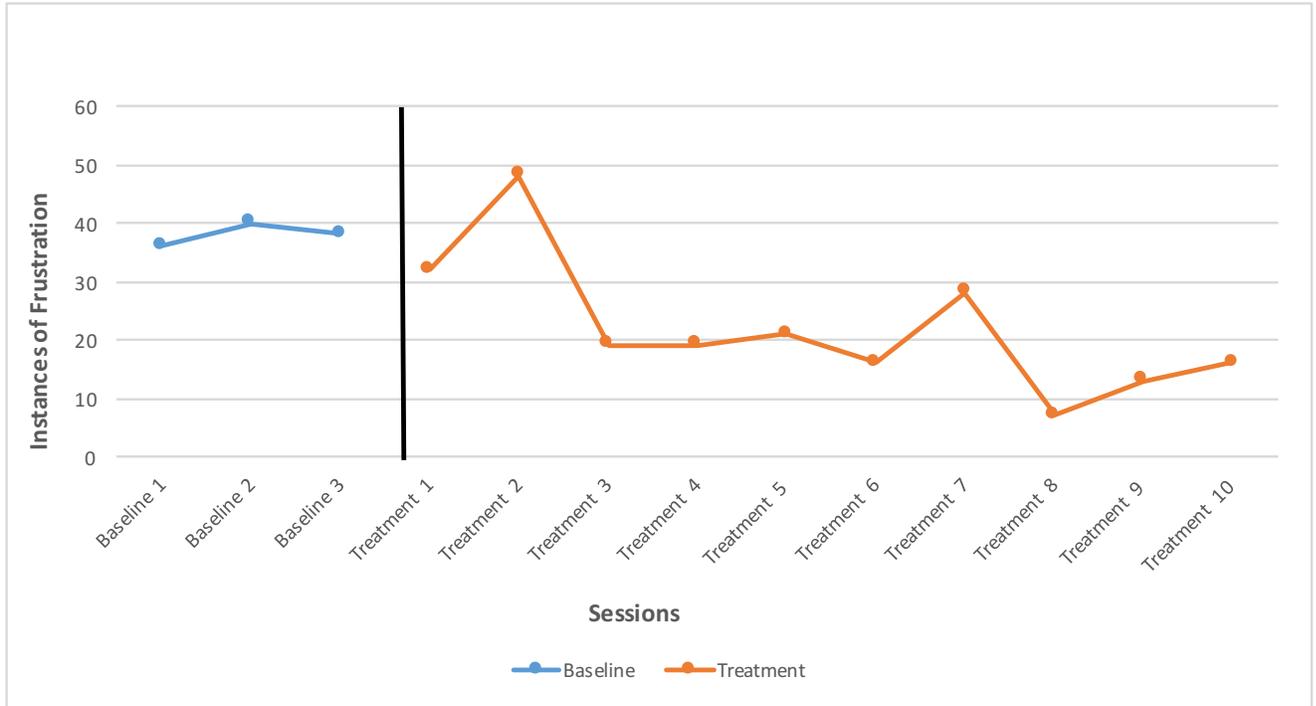
Figure 3.1 Total number of problem behaviors during baseline and baby sign treatment.

The total number of problem behaviors were coded into their subsequent categories to further analyze the reductions within specific domains (See Table 3.1). Aggressive behaviors (i.e hitting an object/person, throwing a toy, and shoving an item away) accounted for 42.8% of L.R's problem behaviors (mean of 16, range:11-23) during baseline sessions. Following treatment, the average of aggressive behaviors reduced to a mean of 7 (range: 6-22) (See Table 3.2).

The second highest category observed was grabbing behaviors, which accounted for 30.7% of L.R's baseline behaviors (See Table 3.1). The mean computed for this category was 12

(range: 9-16). Following treatment, grabbing behaviors reduced to 13.74% of total behaviors

with a mean of 3 (range: 2-7). This category observed the highest reduction from baseline.

Tantrums [i.e. crying, waving arms up and down in frustration, bouncing up and down,

lying on the floor] were the last category coded. These behaviors accounted for 26.5% of total

problem behaviors during baseline (See Table 3.1). A mean of 10 (range of 7-12) was computed

at baseline. Following treatment, these behaviors reduced to a mean of 7 (range of 1-16) (See

Table 3.2).

Although the amount of behaviors varied across sessions, an overall reduction was

observed within each category as computed by the mean. Naturally as a consequence of grabbing

behaviors reducing to a small proportion of the total amount of problem behaviors, aggressive

and tantrum behaviors constituted a larger percentage of total behaviors during treatment

analysis.

Table 3.1 Categories of problem behaviors during baseline sessions.

Sessions	Tantrums	Grabbing	Aggression	Total
Baseline 1	12 (33%)	9 (25%)	15 (42)	36
Baseline 2	7 (17.5%)	10 (25%)	23 (57.5%)	40
Baseline 3	11 (29%)	16 (42%)	11 (29%)	38
Mean	10	12	16	38
Percent of Total Behaviors	26.5%	30.7%	42.8%	

Table 3.2 Categories of problem behaviors during treatment sessions.

Sessions	Tantrums	Grabbing	Aggression	Total
Treatment 1	16 (50%)	5 (15.6%)	11 (34.4)	32
Treatment 2	13 (27.1%)	4 (8.3%)	31 (64.6%)	48
Treatment 3	6 (31.6%)	7 (36.8%)	6 (31.6%)	19
Treatment 4	8 (42.1%)	3 (15.8%)	8 (42.1%)	19
Treatment 5	1 (4.8%)	1 (4.8%)	19 (90.4%)	21
Treatment 6	1 (6.2%)	1 (6.2%)	14 (87.5%)	16
Treatment 7	6 (21.4%)	0 (0%)	22 (78.6%)	28
Treatment 8	4 (57.1%)	1 (14.3%)	2 (28.6%)	7
Treatment 9	2 (15.4%)	3 (23.1%)	8 (61.5%)	13
Treatment 10	8 (50%)	2 (12.5%)	6 (37.5%)	16
Mean	7	3	7	
Percent of Total Behaviors	30.57%	13.74%	55.68%	

Non-symbolic and Representational Gestures

The participant produced an average of 15 non-symbolic gestures and 0 representational gestures prior to baseline sessions. Communicative changes following baby sign treatment were

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characterized by an overall increase in non-symbolic and symbolic gestures. This data was not subject to any analyses but were rather observed and reported. At the conclusion of the baby sign phase, the participant was able to approximate the following signs: BALL, COMPUTER, RATTLE, BUBBLES, and ALL DONE. In addition to sign approximations, the participant began shaking her head yes/no in response to stimulus items she wanted and increased word approximations. Non-symbolic gestures were variable across sessions, but were observed with a general increase as treatment progressed. The average of non-symbolic gestures increased to 32 during baby sign treatment. During the sessions that the patient did not produce more non-symbolic gestures as compared to baseline, examiners observed an increase in symbolic gestures.

Interview portion

Following conduction of baby sign study, parents reported an increased use of the signs taught in session. Signs that the infant did not produce during the baby sign phase emerged at home during play at a later date. For example, L.R's father reported that she independently produced the sign for GIRAFFE during play with her stuffed animal. The parents reported continued usage of baby sign at home and stated that the participant used baby sign in conjunction with word approximations.

Chapter 4: Discussion

In the present study, an 11-month old infant was exposed to keyword signs of tangible items and requests within her functional environment. An AB design was utilized to analyze the acquisition of baby signs in correlation to the reduction of operationally defined problem behaviors. Typical problem behaviors included: crying, hitting a toy, shoving an item away, throwing items, and grabbing toys without asking for permission. The participant sustained a 50% reduction in problem behaviors within 10 sessions, with the highest reduction observed in treatment 8 (80% reduction in problem behaviors from baseline).

Effect size analyses of the data revealed a moderately effective treatment intervention (PND of 90%). However, it is important to note that the spikes in problem behaviors during the course of treatment may have been attributed to other factors. L.R displayed 49 problem behaviors in treatment 2, which was higher than any of her baseline sessions. This session was the only one conducted in the participant's home, which may have increased distractions and impacted behavior. A rise in problem behaviors was also noted for treatment 7. Per parent report, the participant received vaccinations that day and had been irritable. For the remainder of the study, the participant demonstrated a decrease in problem behaviors across treatments. Although the last three sessions showed a slight increase from sessions 8 to 10, results are still below the required amount to achieve criteria (19 instances of frustration-50% reduction in problem behaviors).

Descriptive statistics additionally suggest that baby sign treatment was beneficial in reducing all categories of problem behaviors, with the highest reported change observed in grabbing behaviors. This is especially important in academic settings where turn-taking is needed. Mean values for tantrum, grabbing, and aggressive behaviors were 10, 12, and 16

respectively during baseline sessions. Tantrums reduced to a mean of 7, grabbing reduced to a mean of 3, and aggressive behaviors reduced to a mean of 7. A wide range was reported for each category. However, this is likely due to the progression of treatment over time, as well as the spikes in problem behaviors due to external events.

Following baby sign treatment, the number of non-symbolic and symbolic gestures also increased. L.R was able to produce the signs for BALL, COMPUTER, RATTLE, BUBBLES, and ALL DONE and shake her head no/yes in response to items she wanted or didn't want. The acquisition of these symbolic gestures in lieu of verbal output may have assisted in reducing resultant problem behaviors.

It is important to note that the participant was recruited from a family of higher socioeconomic status, which may have had implications on language development and acquisition. It is suggested that infants from these families may have more exposure to vocabulary words that are crucial to communicating different desires and needs (Hoff, 2003). This consideration may be important when evaluating L.R.'s progression through treatment. Furthermore, it was revealed that the participant had received some limited exposure to baby sign before the study. This may have impacted overall acquisition and retention of signs.

4.1 Limitations

Threats to internal validity when analyzing the behaviors observed include maturation of the participant. The study was conducted over a period of 2 months during an age that is associated with rapid growth and development. Since the child was typically developing, an increase in gesture development, word approximations, and sign approximations could be attributed to the child getting older and acquiring language. The reduction of problem behaviors

could also be attributed to the child's familiarity with the clinician as time progressed. However, the behaviors recorded were generally tied to not acquiring the desired object or action of choice. Limitations of the study also include a small sample size of one participant.

Future research

Systematic replication with additional subjects and a more representative population is necessary to analyze how baby sign can be used to reduce problem behaviors in typically developing populations. Ideally, future research would utilize a multiple baseline design across participants and analyze for maintenance posttreatment. Future research should continue analyzing the specific categories of problem behaviors that could benefit from baby sign treatment. The setting selected may have also influenced the type of behaviors that were exhibited, as problem behaviors at home may differ from problem behaviors in a more academically structured environment. In addition, inconclusive results regarding dosage frequency on milieu teaching could have had an effect on the individual outcomes of each participant.

Since our study utilized a high-dosage model, future research should examine an adapted, low-dosage model of MT to evaluate the efficacy of baby sign. Future research should also examine the correlation between the acquisition of baby signs and problem behaviors in children with autism spectrum disorders. To date, research has shown that PECS is an effective means of communication for special populations as it involves the usage of visual representations during a communicative exchange. Baby sign is also a non-vocal method that involves visual processing and simple motor movements. Thus, it would be compelling to determine if it could be used as an alternative form of communication for children with autism.

It would also be interesting to conduct a study to examine whether or not baby sign strengthens parent-child relationships as suggested by previous studies. This is an important factor to consider as this variable may be a factor in the type and frequency of problem behaviors that are exhibited. Data from questionnaires should give insight into overall quality of life and perceived changes in relationships following the facilitation of baby sign.

4.2 Conclusions

Despite the limitations of the present study, the results provide a promising look into the growing research of baby sign. Replication is needed to determine whether the proposed benefits of baby sign can be supported through empirical research. Research conducted by Mueller et al (2014) indicated that baby sign could be used to increase all domains of development (e.g. cognitive, social, language, fine motor, etc). The results from this study expand on Mueller's research and support the benefits highlighted by newscasts and other social media proponents. Data from this research suggest that baby sign has the potential to enhance the richness of communicative exchange by reducing the problem behaviors that are associated with frustration from lack of verbal acquisition.

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Child Case History and Screening Form

Name of child: _____   Date of birth: _____

Gender (circle one):   Male   Female

Address: _____

Name of caregiver(s): _____

Email: _____   Phone: _____

Family monthly income:

___ Less than $20,000 ___$20,001 to $40,000 ___$40,001 to $60,000 ___$60,001 to $80,000
___Over $80, 001

Medical/Developmental History

1. Were there any complications during pregnancy or birth?   Yes   No
    If yes, please describe:

2. Has your child gone to the hospital for any serious injury or illness? (high fever, head
    injury, etc)   Yes   No
    If yes, please describe:

3. Is your child taking any medications? If yes, please identify.

4. Is your child currently seeing a doctor or specialist (physical therapist, speech-language
    pathologist, occupational therapist, neurologist, etc.) for a specific disease or disorder?

5. Is there any family history of speech delay and/or learning difficulties?

6. What language(s) is your child exposed to at home?

7. Has your child been exposed to sign language in the past?

8. Do you have any knowledge of sign language?

9. What does your child do when he/she is frustrated or can't communicate with you?

10. List as many items (toys, food, etc.) that you can think of that are highly engaging/motivating to your child.

_____ _____

Printed Name   Date

_____

Signature

Vita

Nguyen-chau Dinh was born and raised in Houston, Texas as the second daughter of Trung Van and Truocdao Ngo Dinh. She completed her undergraduate degree at the University of Texas at Austin, where she made it a point to seek out enriching opportunities. Her experiences include serving as a clinician in the Michael and Tami Lang Stuttering Institute, a conversation partner in the Adult Autism Group, and an intern in the Habla Lab. Her curiosity for research was perpetuated when she assisted Dr. Thomas Marquardt in a study comparing generative naming tasks in Vietnamese/English bilingual speakers.

Nguyen worked as a speech-language pathologist assistant at Cole Pediatric Therapy for a year prior to pursuing a master's degree at the University of Texas at El Paso. There, she assisted Dr. Mueller in conducting a baby sign workshop at the University Heights Early Learning Center and providing a binder of 150+ signs to day care providers. She had the opportunity of presenting the findings from this paper at the 2017 ASHA convention in Los Angeles.

After completion of this degree, Nguyen wishes to work in an acute care or inpatient setting for her clinical fellowship. She intends on staying immersed in the literature and using her knowledge to educate future clinicians.