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Mothers Present Words Differently When Paired With Representational Gestures

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Mothers Present Words Differently When Paired With Representational Gestures

A Thesis Submitted to the

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By

Ruth Freidel

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Capstone Approval Page

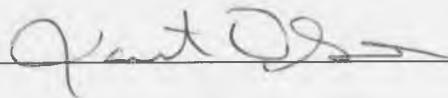
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Mothers Present Words Differently When Paired With Representational Gestures

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HONORS THESIS ABSTRACT

Using representational gestures with infants has been advocated as beneficial to early language development (Acredolo & Goodwyn, 1996). However, it is not known if mothers' speech changes or if mother-infant interactions change, when mothers are asked to use representational gestures. Therefore, the current study examined 24 mother-infant dyads at 13 months during book sharing, with one group of dyads using representational gestures and the other looking at the book as they would at home. Mothers' utterances containing 8 target words were examined for differences between the groups in MLUw, frequency of targets, target words in final position, and one-word target utterances; time was also examined. Significant differences were observed while mothers were using representational gestures in both the average length of utterances and time spent engaged with the book. These changes might begin to explain why Baby Sign ® may be helpful for early language development.

Keywords: representational gestures, vocabulary, maternal influence, joint attention

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ABSTRACT (100-200 WORDS):

Using representational gestures with infants has been advocated as beneficial to early language development (Acredolo & Goodwyn, 1996). However, it is not known if mothers' speech changes or if mother-infant interactions change, when mothers are asked to use representational gestures. Therefore, the current study examined 24 mother-infant dyads at 13 months during book sharing, with one group of dyads using representational gestures and the other looking at the book as they would at home. Mothers' utterances containing 8 target words were examined for differences between the groups in MLUw, frequency of targets, target words in final position, and one-word target utterances; time was also examined. Significant differences were observed while mothers were using representational gestures in both the average length of utterances and time spent engaged with the book. These changes might begin to explain why Baby Sign ® may be helpful for early language development.

Introduction

Baby Sign ® is a commercially available program that teaches hearing infants to use hand gestures to symbolically represent objects, actions, and other concepts (Acredolo & Goodwyn, 1996). These gestures are more formally known as representational or symbolic gestures (Capone & McGregor, 2004; Johnston, Durieux-Smith, & Bloom, 2005; Puccini & Liszkowski, 2012). Baby Sign ® has been growing in popularity for parents and their infants because it has been promoted as beneficial for parents and their infants. Acredolo and Goodwyn (1996) suggest that there are many benefits to teaching infants representational gestures including better communication, language acquisition, intellectual development, and enhancing the bond between parents and their child.

There is some evidence that Baby Sign ® might promote vocabulary development. Acredolo and Goodwyn (1988) researched the relation between using representational gestures and vocabulary. They found that whether or not infants were taught symbolic gestures was heavily related to early language development, even when accounting for the variables of sex, sibling status, and mother's education. Zammit and Schafer (2011) also found that mothers' labels paired with iconic (representational) gestures correlated with the emergence of the target words in infants' receptive vocabularies. Other researchers, however, have questioned whether or not Baby Sign ® is beneficial to children's language development because few well controlled studies have been completed (see Johnston et al., 2005; Puccini & Liszkowski 2012). Nevertheless, it is not clear why using representational gestures might be beneficial for vocabulary acquisition. Is it something with the gesture itself or do mothers also change their speech in a way that promotes language development? This current study examined if mothers'

speech changes when they teach representational gestures in ways that are known to be beneficial to infants' language development.

Beneficial Features of Maternal Speech

It is possible that using symbolic gestures is beneficial to children's language development because mothers present words in a way that promotes language development when they use symbolic gestures. It is known that word learning is affected by several linguistic features of mothers' speech, including frequency of word use, placing words in utterance final position, mean length of utterance (MLU), and using words in isolation (i.e., one-word utterances). For example, Huttenlocher, Haight, Bryk, Seltzer, and Lyons (1991) found a positive relationship between the frequency of a word in a mother's speech and the acquisition age of the word for the child. Zammit and Schafer (2011) also found that the frequency with which a mother labeled an object predicted how early the word would appear in both the child's receptive and expressive vocabularies. They concluded that children who hear target labels more often will tend to learn the target words faster.

Studies also suggest that utterance final position can also be facilitative to word learning. Shady and Gerken (1999) found that there was a significant improvement in comprehension for children when words were placed in utterance final position as compared to words placed internally in an utterance. Echols and Newport (1992) suggest that words in final position may be easier for a child to segment and then store. Finally, shorter utterances (smaller MLU) have been shown to be more linguistically salient to infants early in development (Conti-Ramsden, 1985; Furrow, Nelson, & Benedict, 1979; Snow, Perlman, & Nathan, 1987). When an utterance is shorter in length, there are fewer words for an infant to sort through to determine meaning.

Hence, if an utterance is one word in length, the perceptual salience of the word might be increased, making it easier for the infant to learn the word within the utterance.

There is some evidence that when mothers use representational gestures, their speech appears to change in a number of ways. Walker and Olson (2012) examined mothers' speech within both a representational gesture task and a nongesture task. In the gesture task mothers were asked to present four symbolic gestures during a book sharing task and in the nongesture task to play as they would at home (Walker & Olson, 2012). They found that mothers used shorter utterances (shorter MLU), produced more one-word presentations of target words, and produced more target nouns and verbs in utterance final position when they presented the words with gestures than when presented without gesture. However, since maternal speech was examined across contexts, the changes in mothers' speech could be due to the different interactional contexts rather than the representational gestures. For example, Snow et al. (1976) found in Dutch-speaking mothers that mothers' speech was more complex during book reading than during play (as cited in Snow et al., 1987, p. 71). Because mothers' speech differs during book sharing and play, it is not certain that the changes in mothers' speech reported by Walker and Olson (2012) were due to the use of representational gestures. Therefore, the current study analyzed mothers' speech in the same book sharing task with and without representational gestures to determine if the differences in maternal speech reported by Walker and Olson (2012) remained with interactional context held constant.

Book Sharing as Joint Attention

Book sharing is a unique interaction marked not only by more complex speech from mothers but by increased periods of joint attention (Snow et al., 1976; Yont, Snow, & Vernon-Feagans, 2003). Joint attention involves the sharing of attention between a child, another person,

and a third entity (Cleveland, Schug, & Striano 2007). Tomasello and Farrar (1986) suggest that joint attention is important to early language acquisition because the extended joint attention episodes provide non-linguistic scaffolding for early linguistic interactions that help them define the referent of abstract linguistic symbols. They found that within joint attention episodes the infants produced more utterances and object referent words and mothers also produced shorter utterances. Importantly, the object labels that the mothers produced inside but not outside the joint attention episodes correlated positively with the children's vocabulary size (Tomasello & Farrar, 1986). Therefore, it is a reasonable deduction that the more time the parent and child engage in book sharing the more opportunities there will be for discussion and labeling.

Adamson, Bakeman, and Deckner (2004) found that the total amount of time young children spent in symbol-infused supported joint engagement (i.e., where the child is not explicitly attending to the mother) was a substantial factor in predicting the children's expressive and receptive vocabularies. Therefore, the current study analyzed the time spent engaged in the book sharing activity to determine if dyads spend more time in joint attention when mothers use representational gestures.

In summary, the current study examined if mothers' speech changes when they use representational gestures in the way evidenced by Walker and Olson (2012) with interactional context held constant. This study examined mothers' speech for changes in MLU, number of one-word utterances with a target, frequency of targets, and number of target words in final position. If the use of representational gestures accounts for changes in maternal speech, then the current study should find the same differences reported by Walker and Olson (2012). It also examined if mothers and infants spend more time engaged in book sharing when mothers use representational gestures.

Method

Overview

The current study uses previously analyzed data and new data. It compares mothers' speech during a nongesture book sharing task with data from Walker and Olson's (2012) study, where mothers' speech was paired with representational gestures during book sharing. The new transcriptions from the nongesture task are compared with the existing transcriptions from Walker and Olson (2012). The methodological procedures are presented in two sections. Walker and Olson's procedures are described first followed by the procedures used for the current study.

Existing Data From a Representational Gesture Book Sharing Procedure

(Walker & Olson, 2012)

Participants. Nineteen mother-infant dyads (9 males and 10 females) participated when the infants were 13 months of age. Mothers' mean age was 30 years (25-39) and all reported living with the infants' fathers. Two mothers had high school diplomas, 10 attended college, and 7 earned graduate degrees. Eighteen dyads were Caucasian and one dyad was Hispanic. Participants were recruited from a Midwestern university community in the United States and all received compensation for participating. Nine of the infants were only children and all had no overt signs of developmental delay. Infants' average expressive vocabulary size was 10.5 (0-58) and their average receptive vocabulary size was 73 (12-257).

Representational gesture book sharing task. Mother-infant dyads were seen in a laboratory room and after participating in a play session were given a picture book to share. Mothers were asked to use four of the following representational gestures with their infants during book sharing: ball, car, bear, duck, throw, dance, go, and open. All representational gestures were formed using two hands, included only one hand motion, corresponded to words

that were easily depicted pictorially, and corresponded to words known to be in the receptive vocabularies of most 13 month olds (Fenson, Marchman, Thal, Reznick, & Bates, 2007).

Mothers correctly produced each of the four representational gestures for experimenters before looking at a book with their infants. This book included the printed target word for the four representational gestures that mothers were asked to use with their infants, as well as a picture of a child using the representational gesture.

Transcription and coding. Coders identified mothers' representational gesture episodes during the representational gesture book sharing task. Because mothers often sustained gesture production, a representational gesture episode began with the onset of a gesture and ended when the gesture stopped. All maternal utterances that were produced during representational gesture episodes were transcribed using Systematic Analysis of Language Transcripts (SALT; Miller & Iglesias, 2008). Only those utterances were used for analyses. The following example illustrates a representational gesture episode.

Mother begins to produce the gesture for duck.

Mother says, "Duck".

Mother says, "Is that a duck?"

Mother says, "Quack".

Mother stops producing the gesture for duck.

Representational gesture episodes were coded for the presence of target words and the presence of repetitive presentations of target words. The number of one word utterances, the number of targets that were placed in final position, and the average length of utterances with target words were also obtained. Two independent coders identified mothers' representational gesture

episodes for 4 dyads. Percent agreement was 100%. Percent agreement was also 100% for identifying the utterances that initiated and terminated each representational gesture episode.

For the current study, the representational gesture book sharing transcripts from Walker & Olson (2012) were time-coded when the dyads started focusing on the book and time-coded when they lost focus. The amount of time dyads spent focused on the book were calculated by summing the time elapsed between the time-codes.

New Data From a Nongesture Book Sharing Procedure

Participants. Five infants (2 males and 3 females) and their mothers participated in this study when the infants were 13 months old, and the dyads were part of a larger longitudinal study. Mothers were English-speaking, Caucasian individuals with educational backgrounds ranging from some college to graduate degrees. Mothers all reported living with the child's father. Maternal mean age was 34 years (25-41). The infants were all reported to be typically developing and showed no overt signs of developmental delay. Two infants were only children, with the mean number of siblings being 1.6 (1-5). Participants were recruited from a Midwestern university community in the United States and all received compensation for participating. Infants' average expressive vocabulary size was 14.8 (3-47) and their average receptive vocabulary size was 122 (15-278).

Nongesture book sharing task. After the infant-mother dyads participated in a play session in a laboratory room, they were given a picture book to share. Mothers were instructed to read the book as they would at home. The book included pictures of objects and actions intended to elicit the following 8 target words: ball, car, bear, duck, throw, dance, go, and open. This book was similar in almost all aspects to the book used in Walker and Olson (2012) except the pictures

of children using representational gestures were cropped so their hands (i.e. gestures) weren't visible.

Transcription and coding. The nongesture book sharing task sessions were videotaped and transcribed using SALT (Miller & Iglesias, 2008). Transcription began when the mother initiated interest in the book and ended when interest was lost. Mothers occasionally were not focused on the book for a period of time, but then would return their focus to the book. The utterances mothers produced during these breaks were not considered in the analyses.

Once the interaction was transcribed, the maternal utterances were coded in SALT for the presence of target words, target words in final position, and one word utterances. For the target words *go* and *open* if the utterances were not produced in the context the book intended to elicit, they were not considered as targets. For example, *go* was also not considered a target if it was used in its progressive form in combination with an infinitive phrase such as *He is going to swim*. Inflected versions of target words were counted. For example, *dancing* was counted for the target word *dance*. SALT was used to calculate MLU in words for utterances containing target words.

Using SALT, the transcripts were time-coded when the dyads started focusing on the book and time-coded when they lost focus. The amount of time dyads spent focused on the book was calculated by summing the time elapsed between the time-stamps.

Hypotheses and Results

The 'Results' section is organized according to hypothesis then result. All the hypotheses were tested using independent *t* tests with degrees of freedom and significance given. See *Table 1* for means and standard deviations.

Since the targets in the book were clearly identified through both pictures and printed words, mothers participating in both tasks used the target words throughout their interactions.

Mothers in the nongesture task presented the target words, but did not pair them with symbolic gestures. The target words were comprised of 4 nouns (ball, bear, duck and car) and 4 verbs (throw, dance, open, and go). Mothers in the representational gesture group used target word utterances such as the following: “You throw the ball,” “Duck,” and “Where’s dancing bear?” Mothers in the nongesture group used target word utterances such as the following: “Is that a ball?” “Do you see the ducks?” and “Go.” For all of the analyses except time elapsed, only the maternal utterances containing one or more targets were considered.

Hypothesis 1

Mothers will have shorter utterances containing target words during the representational gesture book sharing task than in the nongesture book sharing task.

An independent *t* test revealed that mothers' utterances containing targets were significantly shorter during the gesture task than during the nongesture task as measured by MLU_w, $t(22) = -2.51, p = .020$.

Hypothesis 2

Mothers will say more target words during the representational gesture book sharing task than in the nongesture book sharing task.

The number of total targets mothers used during the book sharing task did not differ significantly during the representational gesture and nongesture book sharing task, analyzed via an independent *t* test, $t(22) = .275, p = .786$.

Hypothesis 3

Mothers will present more target words in final position during the representational gesture book sharing task than in the nongesture book sharing task.

An independent t test showed that mothers did not place significantly more target words in final position during the representational gesture task than during the nongesture task, $t(20.8)=1.46, p=.160$.

Hypothesis 4

Mothers will use more one-word target utterances during the representational gesture book sharing task than during the nongesture book sharing task.

Mothers did not use significantly more one-word target utterances during the representational gesture task than during the nongesture task, analyzed via an independent t test. However, there was a trend toward using more one-word utterances in the gesture condition, $t(22)=1.80, p=.086$.

Hypothesis 5

Mothers and infants will spend more time focused on the book during the representational gesture book sharing task than in the nongesture book sharing task.

An independent t test revealed that mothers and infants spent significantly more time (measured in seconds) engaged in the book sharing task while using representational gestures than in the nongesture task, $t(22)=2.87, p=.009$.

Table 1

Means (and standard deviations) by Context

Context	MLUw	Total Targets	Final Position	1 Word	Time(sec)
Gesture Task n = 19	2.21(.76)	27.00(18.75)	21.32(14.03)	13.63(10.82)	185.05(66.81)
Nongesture Task n = 5	3.15(.70)	24.60(8.50)	15.80(4.44)	4.60(4.56)	94.00(42.54)

Note: Calculations for all except time were made with only utterances containing a target.

Discussion

Although using representational gestures has been promoted as being beneficial for early language development, little is known about why it might be beneficial (Acredolo & Goodwyn, 1996). It is possible that the mothers' speech may change in a way that begins to account for the possible benefits of representational gestures on early language development. When mothers place words in final position, use shorter utterances (smaller MLU, one-word utterances), and use words more frequently, the words are more salient and are better for early language acquisition (Conti-Ramsden, 1985; Huttenlocher et al., 1991; Shady & Gerken, 1999). Walker and Olson (2012) found that mothers shortened their utterances and placed more words in final position when using representational gestures; however, it was across interactional context. This study examined mothers' speech to determine if it changes in ways that have been shown to be beneficial for children's language acquisition, when the context is held constant. This study also examined time to determine if it changes in a way that might also account for benefits to language development.

All of the maternal linguistic changes observed by Walker and Olson (2012) were expected to remain when interactional context was held constant, but they did not. MLUw remained significantly shorter, and there was a trend toward more one-word utterances for mothers during the representational gesture task. However, mothers no longer placed more target words in utterance final position.

Mothers shortened their utterances with targets significantly when they were using representational gestures. It is possible that mothers were so focused on their sign production they inadvertently used many one-word utterances which decreased MLUw as well as making the target words more salient for early word acquisition (Conti-Ramsden, 1985; Huttenlocher et

al., 1991; Shady & Gerken, 1999). Cleave and Kay-Raining Bird (2006) found that mothers highlight unfamiliar words in their speech by placing them in more salient positions and that this helps with word learning. Since mothers in the representational gesture book sharing group were instructed to teach the sign to their infants, mothers may have changed their speech in such a way to emphasize and highlight the unfamiliar signs to their infants. Although the words themselves were familiar to the infants according to the mothers, the signs were not. It is also possible that mothers instinctively shortened their speech while signing, in order to give the infants less to focus on, as well as giving themselves less to do, since there is a limited amount of information one can attend to at a given time. There was also a trend in the data showing that the mothers who used representational gestures were likely to use more one-word utterances. The means for the representational and nongesture groups were 13.63 and 4.60 respectively, appearing different but not reaching statistical significance. This could be due to the small and uneven sample sizes, limiting the statistical power to detect differences. It is also possible that if proportions were used, results might have shown statistical significance because the number of utterances produced in the representational gesture group was larger. Nevertheless, mothers shortening the length of their utterances with representational gestures could be one of the reasons why Baby Signs ® is positively linked with children's early language development.

It is rather surprising that mothers did not use significantly more target words in final position during the representational gesture task. The means appear quite different between representational and nongesture, 21.32 and 15.80 respectively, but they did not reach statistical significance. If the samples were equal and included more participants, the frequency of targets placed in final position could potentially become a trend towards increased frequency when mothers use representational gestures. The fact that the numbers did not come out as significant

could also be due to a measurement issue. It may have been more accurate to use a proportion of the amount of targets placed in final position over the total targets for each mother, and then compare the proportions between the groups to see if the percentage of targets placed in final position is significantly different between the groups. This would be important to determine since the number of words in final position has been shown to be helpful for early language development (Echols & Newport, 1992; Shady & Gerken, 1999).

Mothers' number of target words did not vary significantly between the groups. It is not surprising that mothers used similar numbers of target words during both book sharing tasks because the topic of conversation was constrained by the book sharing task. Both groups of mothers were looking at the same set of pictures with the same printed words. Mothers are likely to label the pictures in the book with similar frequency. It is not too unexpected then that the number of target words the mothers used did not differ significantly between the representational gesture and nongesture book sharing tasks. The mean (and standard deviation) for total targets for the representational gesture group was 27.00(18.75), compared with 24.60(8.50) in the nongesture task. The means for the two groups are close; however, it is important to note that the standard deviation for the representational gesture group is quite large, indicating much more variability as compared with the nongesture group. With a greater sample size, it is possible that the difference could become great enough to be a trend towards more targets. More research is needed to see if a trend would appear, since frequency of exposure to labels is important for language acquisition (Huttenlocher et al., 1991; Zammit & Schafer, 2011).

Dyads spent more time engaged in book sharing when mothers used representational gestures. Because the dyads spent more time engaged in book sharing, the increased time would allow for more joint attention episodes for the dyads. Adamson et al. (2004) found that the

amount of time infants spent engaged in symbol-infused supported joint attention was positively related to vocabulary size. They defined symbol-infused supported joint attention as occurring when the dyad is focused on the same object and the child appears to be actively attending to the object, but without the child explicitly attending to the mother. During the book sharing task in the current study, the child was often seated on the mothers' lap, the child was not necessarily explicitly attending to the mother, but his or her attention was often clearly on the book or on the mother's gestures in the representational gesture book sharing group. Since it appears that the children during these tasks were engaging in mostly symbol-infused joint attention, the increased time spent when mothers gestured could begin to explain why Baby Sign ® might be helpful for early language acquisition. Future studies should more closely examine this possible link.

One reason the infants and mothers engaged longer when the mothers gestured, could be that the gestures are perceptually salient and interesting to the infants, which caused them to engage for a longer amount of time. Pruden, Hirsh-Pasek, Golinkoff, and Hennon (2006) found that 10 month-olds regardless of the social intent of the speaker, mapped the learned word to the object that was more interesting and perceptually salient to them. They suggested that at 12 months infants learn vocabulary through perceptual means and that by 18 months they learn it through social cues. It is likely that the infants in the current study were interested in the gestures, which kept them engaged longer in the representational gesture book sharing task. As infants become older and begin to rely more on social cues, it is possible that if mothers are socially interacting with them through the use of representational gestures, the infants' vocabularies may increase. Representational gestures may be both perceptually (when they are younger) and socially engaging (when they age) for infants. Further studies should examine this.

It is also interesting to consider why mothers did not say significantly more target words during the representational gesture task, but did spend significantly more time engaged in book sharing during the representational gesture task. It is plausible that the target words might be more spaced out during the gesture task, which could enhance language acquisition. Riches, Tomasello, and Conti-Ramsden (2005) found that word learning in children with SLI was affected by the frequency of word presentations, but it was more impacted by the spacing of the words. Schwartz and Terrell (1983) found that fewer, spaced word presentations to infants between 12 and 15 months were more beneficial for their word learning than an increased amount of presentations (as cited in Riches et al., 2005). It would be of interest to see if the spacing between words is significantly different between the two book sharing groups. Measuring the frequency of words per minute might better enable one to determine if the representational gesture group's target words were more spaced out. If significantly different from the nongesture book sharing group, word spacing could be another reason for why using representational gestures might be beneficial for infants' early word learning.

In summary, MLUw and time spent focused on the book were found to be significantly different across the representational and nongesture groups when interactional context was held constant. One-word utterances also tended to be used with increased frequency when mothers paired speech with representational gestures; however, the number of total targets and number of targets in final position did not vary significantly between the groups. The increased time in joint attention and the shorter maternal utterances might account in part for the link between using Baby Sign ® and increased vocabulary size.

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