

Effects of Contingent Maternal Imitation vs. Contingent Motherese Speech on Infant Canonical Babbling

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Abstract: Maternal vocal stimulation plays a vital role in infants' language acquisition. Contingent maternal imitation and contingent motherese speech were used in an alternating sequence as reinforcers to a 12 month-old infant's canonical babbling. Both vocal contingencies function as reinforcers; however, motherese speech produced the highest frequency of canonical babbling.

In the past three decades, the study of infant vocal development has yielded a deeper understanding of the emerging language in children (Oller, Eilers, Neal, & Schwartz, 1999). Early infant vocalization, starting as early as three weeks after birth, are precursors to speech. The sounds of the infant develop systematically and show a maturation of speech even before the child utters a single word. This knowledge has motivated research to identify infants who may be at risk of developing language delays. Research on older infants' speech, however, is less conclusive and less common than studies with younger infants (McRoberts, McDonough, & Lakusta, 2009). Our programmatic research has shown that the early sounds produced by infants at 3-months elicit a response in adults (Pelaez, Virués-Ortega, & Gewirtz, in press). It is widely recognized that the acquisition of language is facilitated by a special manner in which adults speak to babies and toddlers, called baby-talk, motherese, or infant-directed (ID) speech (Falk, 2004). ID is particularly recognizable in the tone of voice the adults use; it is a type of sing-song way adults commonly use to communicate with young children. This type of speech is also commonly accompanied with visual interaction, gestures, and touch. For example, a mother speaking to her 5 month-old infant might use short sentences, a high pitch, exaggerated intonation, raised eye-brows, and a smile, while asking her baby how he is doing today. A universalist hypothesis states that ID speech may even contribute to initial infant emotional regulation, then to socialization, and finally to the acquisition of speech in a sequential, age-appropriate manner (Falk, 2004).

This research examined the reinforcing effects of two maternal vocal topographies (maternal imitation and motherese speech) on infant vocalization (canonical babbling). The purpose of this research was to find out which type of response is most effective in increasing the frequency of babbling in a 12 month-old infant. We know that children's earliest communication is an attempt to share and obtain information (Golinkoff, 1993) and that infants progressively expand their ability to communicate with others by coordinating behaviors from different expressive modalities, such as gaze, facial expressions, and vocalizations (Lin & Green, 2009). Moreover, infant speech screening procedures can help identify infants who are at risk of speech and language-related disorders (Oller et al., 1999), such as language-based learning disabilities, autism spectrum disorders, and speech delays among others.

Oller et al. (1999) propose 4 stages in infant vocal development. The phonotaxial stage, producing quasivowels, is apparent in the first two months of life. In the second stage, primitive articulation stage, usually apparent at 2-3 months of age, infants produce sounds called cooing. In the third stage, called the expansion stage, infants produce full-like vowel sounds. Finally, in

Bendixen, M. I., & Pelaez, M. (2010). Effects of contingent maternal imitation vs. contingent motherese speech on infant canonical babbling. In M. S. Plakhotnik, S. M. Nielsen, & D. M. Pane (Eds.), *Proceedings of the Ninth Annual College of Education & GSN Research Conference* (pp. 2-6). Miami: Florida International University. http://coeweb.fiu.edu/research_conference/

the canonical stage, infants produce well-formed syllables. Infant speech sounds more like adult speech. Canonical babbling is usually apparent in normally developing infants by the age of 10 months. Oller et al. (1999) point out that infants with language delays almost always begin the canonical stage after 10 months. This research will focus on the canonical stage in infants.

Imitation has been a subject of psychological investigation for many years. It has also been an important concept of study in linguistic development (Kymissis & Poulson, 1990; Pelaez et al., in press). Learning theorists have regarded imitation as a way to facilitate language acquisition in the past. It is now understood that imitation as part of a social interaction is more effective for language acquisition. For this reason, imitation, such as occurs in the context of a social interaction, was used as one of the interventions.

In sum, literature reveals that maternal vocalizations play an important role in language acquisition and development in infants. Pelaez and her colleagues (in press) indicate contingent maternal imitation as a better reinforcer for infants ages 3-8 months. However, no attempt has been made to test this treatment with 12 month old infants. For this reason, this paper focuses on a 12 month-old infant, which is developmentally more advanced than an 8 month-old infant, shifting the effectiveness of the two treatments. The purpose of this research was to determine which type of maternal vocal responses is most effective in increasing the frequency of babbling in a 12 month-old infant. For this reason, in the present study, eye contact, smiles, and positive gaze of the mother were maintained constant. This experiment tested the hypothesis that contingent motherese speech would serve as a better reinforcement than contingent verbal imitation in shaping the infant vocal responses.

Method

Participant

One typically developing 12 month-old white Hispanic infant female and her mother participated in this study. The mother reported no prenatal, perinatal, or postnatal complications. The infant's native language was Spanish.

Setting and Apparatus

The study was conducted in the playroom of the infant's home. The playroom was a self-contained room. The door was shut to minimize distractions. The mother sat on the floor across from the infant and toys were placed on the floor for the child to play with. Toys included wooden blocks, books, a toy phone, and a peek-a-boo plastic toy. One portable camcorder and stopwatch to record time were used.

Design

The infant participated in a baseline followed by alternating treatments and a final probe phase design composed of the following conditions: baseline (control condition) (A₁), imitation (B₁), and motherese (C₁). The following order was used:

A₁A₂A₃A₄B₁C₁B₂C₂B₃C₃B₄C₄...B₁₁C₁₁A₅A₆A₇A₈

Procedure

The mother made sure the infant was fed, dry, and rested during the sessions. Four 2-minute baseline sessions were conducted before the intervention. The mother acted as she normally would act with her infant. The frequency of the infant's vocalization was videotaped.

The two conditions, contingent motherese speech (infant-directed speech) and contingent infant imitation, were implemented through 2-minute sequential trials in single 10-minute sessions. Each condition lasted 2-minutes and was separated by a 30-second inter-trial interval. Conditions were never presented consecutively. The order of the interventions was determined randomly. Both interventions were accompanied by mother smiles and eye contact as normally

occurs between mother and infant. Mother was aware to control for density of stimulation in maternal imitation and motherese speech.

The dependent variable was canonical babbling and can be defined as the production of well-formed syllables, often reduplicated sequences consisting of at least one full vowel-like element and one consonant-like element. Examples: [ba], [ati], [nana], and [dada]. Examples of noncanonical babbling: squealing, growling, coughing, sneezing, grunting, laughing, crying and so on (see Oller et al., 1999). The independent variables were contingent motherese speech and contingent maternal imitation. Motherese speech is a rhythmic type of speech mothers use to communicate with their infants around the world. It is characterized by simplified vocabulary, repetitious, exaggerated vowels, higher overall tone, slower tempo, rising intonations. It is also commonly called “baby-talk” and in research sometimes referred to as ID speech (Falk, 2004). This type of speech is commonly accompanied by smiles, eye contact, gestures, and physical contact. Examples: “Good baby”, “Yeah,” “Aha”. For the purpose of this experiment only eye contact and smiles accompanied motherese speech, which was limited in length appropriate to the child’s length of vocalization. In maternal imitation the mother repeated what the infant said, trying to match length and tone.

Data collection consisted in determining how many well-formed syllables the infant produced. This was performed by analyzing the video recording on the infant and plotting the results. Data was analyzed by counting the frequency of infant vocalization per trial. The frequency of infant vocalizations per 2-minute trial represents a dot on the graph.

Inter-Rater Agreement

One independent observer was trained. Interrater agreement was calculated for 75% of sessions. Interobserver agreement was calculated by dividing the total number of intervals with agreement by the total number of intervals and converting this to a percentage. Interobserver agreement for infant canonical babbling was 85%.

Analysis

Results were visually analyzed. Visual analysis is generally used when continuous numerical data are gathered using permanent records such as a video tape recording, data are graphically depicted, and the researcher examines level (performance on the dependent variable-vocalizations) and trend changes (Richards, Taylor, Ramasamy, & Richards, 1999). In other words, the researcher examines the number of data points, the variability of the performance, and the direction and degree of trends that occur. For the purpose of this research, well formed syllables produced by the infant as a response to the mother’s imitation or motherese were manually counted from the video recording and saved on a spread sheet. These were plotted on a graph (see Figure 1) for visual inspection.

Results

As seen on Figure 1, immediate change in level of behavior when an intervention is presented indicates that both interventions increase the frequency of babbling in the infant. Although there exists some variability, upward trend in the data points is evident. Visual analysis is making inferences about behavioral changes by inspecting and evaluating graphed data (Richards et al., 1999). Visual analysis of the data suggests a higher frequency of canonical babbling during motherese speech ($M=13.8$) than during imitation ($M = 8.9$). It can be concluded that contingent motherese speech increases the frequency of infant canonical babbling in a 12 month-old infant more than contingent imitation.

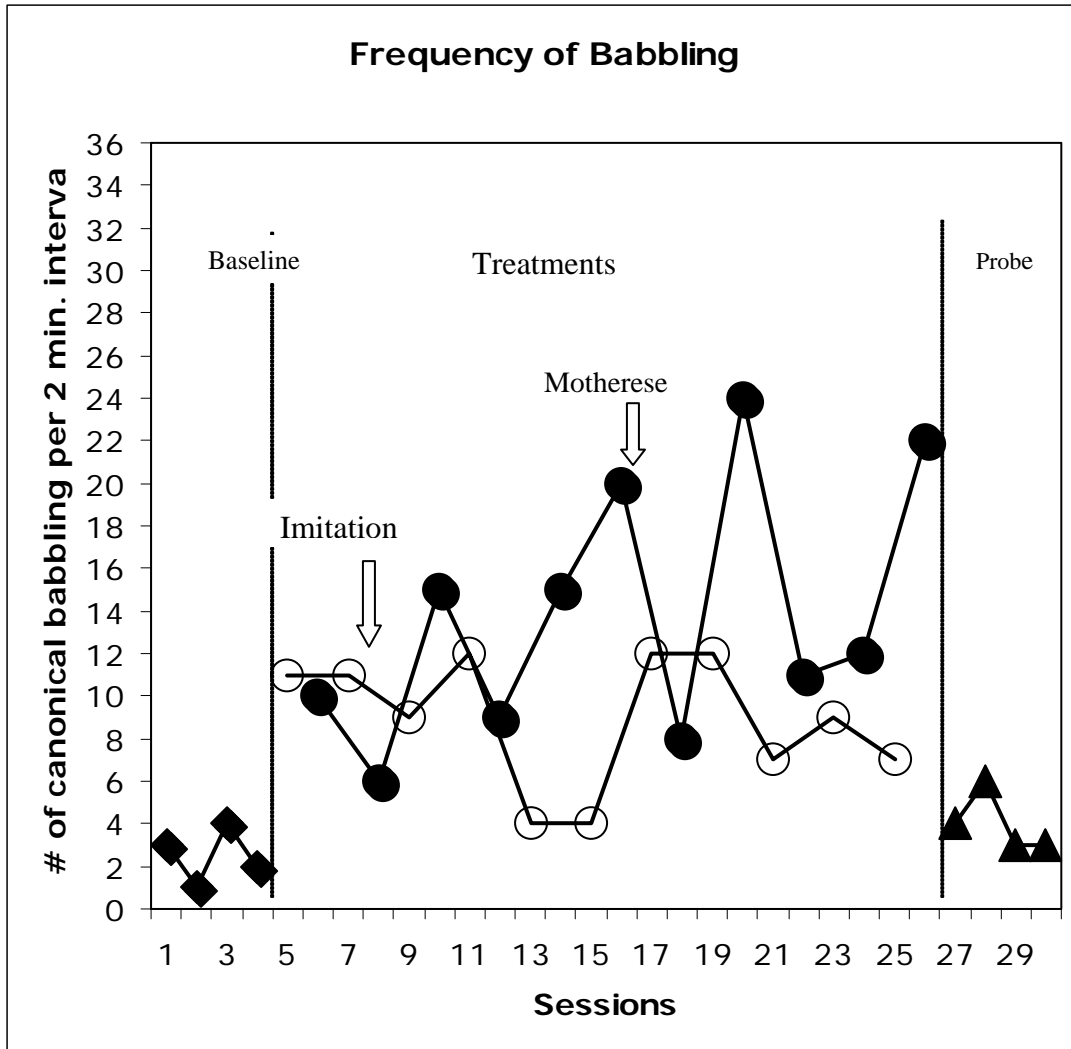


Figure 1. Shows the frequency of infant vocalizations under two treatment conditions: maternal vocal imitation (open circles) versus motherese talk (dark circles) using an alternating treatment design. Baseline was obtained before and after intervention as control phases.

Discussion

This study attempted to separate the reinforcing effects of contingent maternal imitation and contingent motherese speech and showed that the effects of motherese speech on a 12 month-old infant were significantly higher. This study offers a preliminary comparison of the reinforcing effectiveness of motherese speech on 12 month-old infants, which was missing in the literature with older infants.

These results should be taken with caution because they have not yet been replicated at 12 month-old. For future research, it would be useful to use prompts at the beginning of the sessions in order to elicit responses instead of waiting for the infant to spontaneously produce a vocalization. These findings can be useful in the fields of developmental psychology, early childhood education, and speech and language pathology in order to design interventions that are developmentally appropriate for infants at risk of language development.

Limitations

Because motherese in humans is multimodal, involving auditory stimulus as well as gestures, facial expressions, and touch in addition to vocal utterances, results of this study may lack external validity. External validity is the ability to generalize these results to the general population. Although, threats to external validity were controlled to some extent because the observed dyad was a mother and child in their natural environment, to increase external validity we would need a larger sample size.

Conclusion

In early infancy, maternal vocal imitation has served as a more effective reinforcer for infant's vocalization than motherese speech (Pelaez et al., in press). However, as infants develop, the effects of imitation are less and motherese speech seems to have a stronger effect. These preliminary results suggest that even though both contingencies are powerful reinforcers, contingent motherese speech produces a higher frequency of babbling on this particular 12 month-old infant. Overall, these two types of maternal vocal stimuli play a critical role on shaping infant precursors of language.

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