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Predicting 12-Month Vocalization  
Frequency From 4-Month Vocalization  
Frequency

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## Introduction

People have been social experimenting with children for centuries. Some experiments were simply to satisfy our curiosity, and some were revolutionary in helping to find new information about children and child development. Previous studies such as these date back to historic times, from the Language Deprivation Experiments of the 13th century to the 30 Million Word Gap study of 2003 (Hart and Risley, 2003). The current investigation mainly deals with how and why mother-infant interactions can affect an infant's ability to vocalize, starting in their years. The mothers who volunteered for this investigation were from New York City and were given a survey to fill out, along with documented consent. Also, this data is pre-existing and de-identified, as it was taken from data collected for a previous study about face-to-face contact between mothers and their children (Beebe 2018). Some experiments highly support the reasoning that children and child development can be heavily impacted from their environment, whether positively or negatively. While literature emphasizes the role of the caregiver in the development of a baby's developmental skills, the infant's role in this process has also been noted in recent studies. Using this investigation, we can improve upon understanding child development a bit better by recognizing how interactions with a baby's surroundings affect the infant's mental growth. Therefore, we can better comprehend the vocalization patterns in an infant's speech to improve upon understanding children's' development systems.

## Statement of Purpose

The aim of research is mainly to study mother-infant interactions to observe how a mother's vocalizations affects the infant's vocalization frequency between 4 and 12 months old and the infant's learning capabilities, amongst other observations about the infant's physical and psychological state. We also factored in maternal touch, mother anxiety, and tried to watch for learning behaviors of the babies, but these results are not related to the results being explained in this article.

### Materials and Methods

The mothers who volunteered for this investigation were of hispanic origin and were volunteers for a previous, different investigation. However, the data used was pre-existing and de-identified. For this investigation, the volunteer mothers were recorded interacting with their children for about 10 - 12 minutes. The 86 infants were first tested at 4 months, since 4 months is a nodal point in infant development, helping us to predict social/cognitive functions. Video and audio recordings were taken for data collection. Also, a transcribing software was used to create transcriptions for the audio recordings. Then, once the infants were 12 months old, they were recorded interacting with their mothers once again and the same process as before was repeated.

### Results

As mentioned previously, the video recordings were observed and observations were made on tone, behavior, amount of skin-to-skin contact, etc. Also, as said before, the audio recordings were transcribed with an automated software. The recordings were then listened to and the transcriptions were edited to ensure the accuracy of the results. The job of the editor for these transcriptions was to listen to each recording and make sure that the document was accurate based on the recording. This meant looking for mispronunciations, filler words, backgrounds, things like that, and then deleting or changing the words based on the listener's interpretation of the audio. Afterwards, observations were made on the (mother's) word choice, word count (amount of words said to the child), singing, etc. Unfortunately, while there was a table of values created after visualizing these results on an Excel spreadsheet, this table cannot currently be shown due to confidentiality regulations.

### Discussion and Conclusion

With the results of this study, we were able to observe how babies have an impact on their own vocalization and how a mother has an impact on their child's vocalization. This experiment was designed in such a way so that the researchers could observe how the mother's vocalization affects her child's vocalization. Therefore, there is an observed self-contingency with an infant's vocalization; the findings identified an infant self-organizing process. It seems that a child's own

vocalization in prior months is what could be used to predict the progress in their vocalization at 12 months, which means the infant's 4-month vocal activity contributes to development of infant vocalization at 12 months, a view under-emphasized in literature. Contrary to expectation, while measuring maternal word count, we did not see a significant contribution from the mothers towards infant vocalization development at 12 months; nor did we see a contribution of maternal touch quality (another variable we were testing). The results of this investigation help debunk a 2000's theory, the 30-Million Word Gap. Basically, the 30-Million Word Gap was a controversial study that suggested that kids growing up in poverty hear about 30 million fewer words in conversation by the age of 3 than those from more "privileged" backgrounds and that's why children who grow up in poverty appear to struggle in school (Hart and Risley, 2003). Our investigation debunks this theory because according to the results of this study, it does not matter as much how many words or how much talking an infant hears in their surrounding environment since that does not entirely affect their vocalization; the baby's own previous progress in vocalizing is what influences their progress in speech development more. With the results of this study, we learned how baby's have an impact on their own vocalization and how a mother has an impact on their child's vocalization. While the mother's vocalization does not significantly affect the infant's vocalization progress, we can assume that it affects other behavior and psychological tendencies. Using the implications of this study, we can also continue to learn more about the development of a child's verbal skills and the impact of the environment on a child's psychological health. Because contingency of interactive processes is frequently more informative than behavior frequency, in future work we hope to address maternal 4-month contingent coordination of their words with infant vocalizations as a possible predictor of infant 12-month vocalization frequency.

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