

7.5-month-olds' memory for words after a 1-week delay

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In order to build a vocabulary, infants must segment the sound patterns of words from the context of fluent speech and learn their referents. A first step that infants take in building a vocabulary is to encode sound patterns of words into long-term memory, enabling them to recognize the words at different times and in a variety of different contexts. Several studies have addressed infants' ability to encode the sound pattern of words and recognize them in the context of fluent speech. Jusczyk & Aslin (1995) discovered that 7.5-month-old English-learning infants are able to recognize the sound patterns of words in passages when tested immediately after familiarization with the words. Houston and Jusczyk (2001) extended those findings by showing that 7.5-month-olds were able to recognize familiarized words one day after familiarization. In this study, we investigated the possibility that infants can retain information about the sound patterns of words for a much greater period of time – up to one week.

Experiment 1

This experiment was similar to Experiment 1 in Jusczyk and Aslin's (1995) study and to Experiment 1 in Houston and Jusczyk's (2000) study. Infants were familiarized with the same sets of isolated words as in the previous studies, i.e., 'cup' and 'dog' or 'bike' and 'feet'. However, the familiarization period to each word was much longer in the present study (120 seconds) than in previous studies (30 seconds). A longer familiarization was used because it was thought that more repetitions of words may increase the chances that infants would remember them over a one week period. The test phase, as in previous studies, presented passages containing familiar and novel target words. However, the test occurred one week after familiarization rather than immediately following or one day following familiarization.

Method

Subjects.

Twenty-four (11 female, 13 male) 7.5-month-old infants (mean age at test = 34.2 weeks, range: 32 weeks to 39.3 weeks) completed the study. An additional eight infants participated but did not complete the testing due to crying (3), not returning for the second visit (2), not looking to the lights (1), and experiment failure (2). All infants were recruited from monolingual English-speaking homes in the greater Buffalo, NY area.

Design and Procedure

Infants were tested using a modified version of the Headturn Preference Procedure (HPP) (Kemler Nelson et al., 1995). The testing consisted of two phases separated by approximately one week.

Familiarization phase: Each infant was familiarized with repetitions of either *cup* and *dog* or *bike* and *feet* presented in isolation until they accumulated 120 seconds of looking time to each word or until they become too fussy or restless to continue. Approximately one week (mean = 6.36 days; range = 5 days to 8 days) after familiarization, parents returned to the laboratory for the test phase.

Test phase: Infants were presented with four blocks of four passages. These were the same stimuli as in the previous experiments. For each infant, two of the passages contained the familiarized words while the other two passages contained the unfamiliar target words.

Results

Familiarization Phase:

Because we ended the familiarization phase when the infants became too fussy or restless to continue, there was a wide range of orientation times during the familiarization phase. Infants' mean orientation time was 110.7 s (range = 43.9 s to 151.8 s) to *cup*, 119.6 s (range = 45.2 s to 172.4 s) to *dog*, 108.2 s (range = 72.2 s to 142.2 s) to *bike*, and 117.5 s (range = 69.6 s to 145.3 s) to *feet*. A 1-way ANOVA revealed that these differences were not statistically significant ($F(3, 44) < 1$).

Test Phase:

We computed each infant's mean looking time to the passages containing the familiarized and to the unfamiliar passages. On average, infants oriented 8.63 s (SD = 2.48 s) to the passages containing the familiarized words and 8.80 s (SD = 2.71 s) to the unfamiliar passages. A t-test revealed that this difference did not approach significance ($t(23) < 1$).

Discussion

Unlike in previous studies, infants in the present investigation did not exhibit any evidence of recognizing the familiarized words in the passages. These findings are consistent with the possibility that infants are not able to retain the sound patterns of words in memory for one week. However, another possibility is that infants became very fatigued during the extra long familiarization period, which may have affected their performance during the test phase. Indeed, twelve of the twenty-four infants become too restless to complete the full familiarization period. It is possible that infants may perform better with a shorter familiarization period.

Experiment 2

This experiment was a second attempt to test for infants' memory of the sound patterns of spoken words after a one week delay. Given the prediction that 120s of familiarization may have led to fatigue, we returned to the criterion of 30s of listening time to each of the target words during familiarization. We predict that with the potentially competing effects of task fatigue removed, 7.5 month old infants should show recognition of target words one week after being familiarized to them.

Method

Subjects

Twenty-four 7.5-month-old infants completed the study (15 female, 9 male; mean age at test = 7 months, 19 days, range: 7,9 – 7,29). An additional ??? infants participated but did not complete the testing due to ????. All infants were recruited from monolingual English-speaking homes in the Baltimore, Maryland metropolitan area.

Design and Procedure

Infants were tested using a modified version of the Headturn Preference Procedure (HPP) (Kemler Nelson et al., 1995). The testing consisted of two phases separated by approximately one week.

Familiarization phase: Each infant was familiarized with repetitions of either *cup* and *dog* or *bike* and *feet* presented in isolation until they accumulated 30 seconds of looking time to each word. If an infant became fussy during the familiarization period then the experimenter ended the session and informed the caregiver that the family did not need to return for the test visit. Approximately one week after familiarization, parents returned to the laboratory for the test phase (mean delay = 6.96 days; range: 6 – 7 days).

Test phase: Infants were presented with four blocks of four passages (*cup*, *dog*, *bike*, and *feet*). These were the same stimuli as in the previous experiments. For each infant, two of the passages contained the familiarized words while the other two passages contained the unfamiliar target words.

Results

Familiarization Phase:

We did not analyze the looking times from the familiarization phase given that we had an explicit 30s criterion for the amount of time infants should listen to the two words.

Test Phase:

We computed each infant's mean looking time to the passages containing the familiarized words and to the passages containing the unfamiliarized words. Infants did not listen longer to the passages containing the familiar words than to the passages containing the unfamiliar words ($M_{Familiar} = 8.30$, $SD = 2.39$; $M_{Unfamiliar} = 8.58$, $SD = 2.94$; $t(23) = -0.47$, $p = .64$).

Discussion

As in Experiment 1, infants in Experiment 2 did not exhibit any evidence of recognizing the familiarized words in the passages. These findings support the conclusion of Experiment 1 that 7.5 month old infants are not able to retain the sound patterns of words in memory for one week. In addition, the long familiarization period of Experiment 1 is possibly not the only reason those infants failed to show a listening preference for the passages with the familiar words. Experiment 2 used a 30s familiarization criterion and also showed no preference for the passages with the familiar words.

General Conclusions

Together these experiments show that 7.5 month old infants do not recognize previously familiarized spoken words after a week delay. At least three points should be clarified about this conclusion. First, the infants' task was to store sound patterns of isolated words and recognize them in fluent speech passages at test. It is possible that 7.5 month old infants do retain the sound patterns of words presented in isolation and would recognize them during a test phase that also presented isolated words. Second, the familiarization methods used in these experiments may not be sufficient to reveal infants' recognition ability. Specifically, the familiarization phases provided an intensive number of isolated tokens over a short period of time. The results of these experiments suggest that this type of exposure is not sufficient for infants to show recognition of the sound patterns of spoken words. We predict that fewer tokens presented over several intervals would more likely lead to recognition after a week delay than the present methods. Finally, the current experiments cannot determine if the infants' failure was one of encoding or one of retrieval. Previous experiments that show success on immediate or 1 day later tests suggest that infants encode the familiarization items to a degree sufficient for short term recall. Future studies will need to determine if the failures after a week delay are due to how the items are initially encoded or due to difficulties in retrieving the items.

In conclusion, it remains an open question as to how long young infants retain the spoken words that they hear. This is a critical issue for understanding their developing lexicons. Those sound patterns that are robustly encoded and efficiently retrieved provide the best exemplars available for forming links with object, person, and event referents in the world.

References

- Houston, D. M., & Jusczyk, P. W. (2001). *Infants' long-term memory for words and voices*. Unpublished manuscript.
- Jusczyk, P. W., & Aslin, R. N. (1995). Infants' detection of the sound patterns of words in fluent speech. *Cognitive Psychology*, 29(1), 1-23.
- Kemler Nelson, D. G., Jusczyk, P. W., Mandel, D. R., Myers, J., Turk, A., & Gerken, L. A. (1995). The Headturn Preference Procedure for testing auditory perception. *Infant Behavior & Development*, 18, 111-116.