

RESEARCH ON SPOKEN LANGUAGE PROCESSING
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Who . . . Me?¹

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Abstract

Among the earliest and most frequent words that infants hear are their names. Yet, little is known about when infants begin to recognize their own names. Using a modified version of the headturn preference procedure, we tested whether 4.5 month olds prefer to listen to their own names over foils which were either matched or mismatched for stress pattern. Our findings provide the first evidence that even these young infants recognize their names. Infants demonstrated significant preferences for their own names both when compared to foils which shared the same stress patterns, as well as to those with opposite patterns. The results suggest that infants are beginning to map sounds to meanings at an early age, well before they comprehend or produce language.

Who . . . Me?

Research on early cognitive and perceptual capacities indicates that infants enter the world equipped with a surprisingly broad set of abilities. For example, infants seem to have a notion of physical identity which matches adult conceptions of object properties. Not only do young infants demonstrate sensitivity to the relative permanence of objects (Baillargeon, Graber, DeVos, & Black, 1990) -- they also appear to have at least a rudimentary understanding of causal relations (Eimas, Siqueland, Jusczyk, & Vigorito, 1971) and of number (Starkey, Spelke, & Gelman, 1990).

The precocious capacities of infants are perhaps best documented for the domain of language. It is well established that, within the first two months of life, infants are able to discriminate a wide range of speech contrasts (Eimas et al., 1971; Trehub, 1976). Moreover, they appear to be able to compensate for stimulus variability introduced into speech by changes in speaking rate (Eimas & Miller, 1980) and talkers' voices (Jusczyk, Pisoni, & Mullennix, 1992; Kuhl, 1979). These early abilities allow infants to begin the process of categorizing the information available in speech and ultimately leads to their acquisition of a native language.

Infants' basic speech perception capacities provide a starting point for discovering how sound patterns are organized in their native language. Because languages differ in their organization of sounds into meaningful units, infants must learn about the characteristics that hold for utterances in their language. There is now evidence that infants begin learning about particular properties of native language utterances from an early age. For example, it has been demonstrated that even newborns show some capacity to discriminate utterances in their mother's native language from those of another language (Mehler, 1988). There are also indications that within the first year, infants learn about aspects of native language sound organization having to do with phonetic categories and their internal structure (Kuhl et al., 1992; Werker & Tees, 1984), the characteristic sequences of sound permitted in words (Jusczyk, Friederici, Wessels, Svenkerud, & Jusczyk, 1993a), and the prosody typical of words (Jusczyk, Cutler, & Redanz, 1993b). However, communication in language requires learning not only about the distinctive sound properties of one's language, but also about how meanings are related to sound patterns.

Whereas many investigations have focused on infants' sensitivities to various sound properties of language, relatively few studies have explored when infants first learn relations between sounds and meanings. What information is available on the latter issue comes largely from studies with infants around 9 months of age who are on the verge of producing their first words (e.g., Benedict, 1979; Huttenlocher, 1974). Such studies indicate that infants at this age show some limited comprehension of a few words. However, these studies do not indicate just when the process of lexical development actually begins.

It is likely that the first opportunity infants have to relate sound and meaning is in situations in which highly salient sound patterns are uttered frequently in a personally relevant communicative setting that actively engages an infant's attention. For example, while playing with an infant, parents frequently use the child's name. When do infants begin to recognize their own names? Considering the potential implications that learning one's own name might have not only for beginning to learn relations between sounds and meanings, but also for establishing an infant's sense of identity, it is surprising that so little attention has been given to this issue in previous research. The present study was designed to explore whether infants, as young as 4 1/2 months, demonstrate any signs that they recognize their own names.

One way to determine if infants recognize their names is to see whether they respond differently to their own names than to other infants' names. For example, are repetitions of infants own names more likely

to capture their attention than repetitions of other names? By carefully selecting which other names to present along with an infant's own name, it should also be possible to gain information about just how precise the infant's representation of his or her name is. For instance, it is certainly possible that at an early stage of development, infants might encode only some rather global features of the sound pattern (e.g., the stress pattern, the number of syllables, etc.) of their names. Consequently, in the present study, we examined whether infants who heard their own names along with stress-matched or stress-mismatched foils, would show any significant tendency to listen to their own names.

Previous research indicates that infants between the ages of 7- and 10-months show signs of comprehending some words. For example, it has been demonstrated that infants between the ages of 8- and 10-months comprehend certain native language words (Benedict, 1979; Huttenlocher, 1974). In addition, 7 1/2-month-olds display some rudimentary capacity for recognizing and retaining words in a fluent speech stream (Jusczyk & Aslin, in press). Because their own names are presumably among the first and most frequent words that infants hear, we decided to test even younger infants to see if they show some evidence for recognizing these special lexical items.

METHOD

Subjects

Twenty-four infants from monolingual English speaking homes were recruited to participate in the present study (Mean age, 149 days; range, 133 days to 167 days). Half of the infants were males, the other half were females. An additional 13 infants were eliminated for excessive fussiness and/or crying (n=9), failure to orient properly to the test apparatus (n=2), and experimenter error/testing interference (n=2).

Stimuli and Apparatus

Infants were presented with repetitions of four different names: their own names, and three foils. The foils were particularly designed to assess whether infants would false alarm to names with prosodic patterns similar to those of their own names. Specifically, one foil matched the stress pattern of the infant's name; the other two followed the opposite stress pattern. For example, an infant whose name was "Aaron" might be presented with three foils such as "Corey" (same stress), "Christine" (opposite stress), and "Michelle" (opposite stress). Table 1 provides a full listing of all infants' names and foils used in the present study⁴. Although all infants heard foils which either matched or mismatched the stress patterns of their own names, they did not all hear exactly the same set of foils. Rather, different sets of foils were used for each infant to control for the possibility that some names might be inherently more interesting to listen to. All names were digitally recorded by a naive female talker who was not given any information concerning which names were foils, and which belonged to infants participating in the experiment. In fact, for some infants, the foils were actually the names of other infants included in the study. These precautions ensured that the infant's own name would not be unduly emphasized relative to any of the foil names used. The talker was encouraged to record the names with lively affect, as if calling to an infant.

⁴ Since studies of this type have not previously been done, it was hard to know a priori which variable would prove most important in infants' representations of names at this early stage. Given the wealth of research which suggests that prosodic factors play a substantial role in early language acquisition, we decided to begin our investigation by manipulating stress pattern alone. Certainly, other variables (e.g. phonetic and featural information) might play an important role as well, and remain a topic for future investigation.

Insert Table 1 about here.

All names were digitized on a VAXStation Model 3176 computer at a sampling rate of 10 kHz via a 12-bit analog-to-digital converter. The digitized stimuli were then transferred to a PDP 11/73 computer, which controlled the presentation of the names and recorded the observer's coding of the infant's responses throughout the testing session.

PROCEDURE

A modified version of the headturn preference procedure was employed (see Juszyk & Aslin, in press; Kemler Nelson et al., in press for an extensive review of the procedure). Each infant sat on a caregiver's lap in the middle of a three-sided enclosure constructed out of pegboard, with panels (4 ft by 6 ft) on three sides and open at the back. An observer monitored the infant's headturns through a small opening in the boards. In addition, a video camera mounted behind the boards recorded each test session. On the center panel of the enclosure directly facing the infant was a green light, mounted at eye level, which could be flashed to attract the infant's attention to midline. A red light was mounted on each side panel, and a loudspeaker was mounted at the infant's ear level behind each side panel. An experimenter, seated behind the center panel, observed the infants through a small hole. She began and terminated trials, and recorded the infant's looking times by operating a response box linked to a PDP 11/73 computer. A test trial began with the flashing of the green light on the center panel. When the infant oriented to the center panel, the green light was extinguished via the response box, and a red light on one of the side panels began to flash. When the infant made a headturn of at least 30 degrees in the direction of the flashing light, the experimenter initiated a speech sample and began recording the infant's looking time by pressing a button on the response box. If the infant turned away from the loudspeaker by 30 degrees for less than 2 consecutive seconds, and then reoriented in the appropriate direction, the trial continued but the time spent looking away from the loudspeaker was eliminated from the total orientation time on that particular trial (the experimenter pressed another button on the response box that stopped the timer). If the infant looked away for more than 2 consecutive sec., the trial was terminated. Both the experimenter and the caregiver wore SONY MDR-V600 sound-insulated headphones and listened to loud masking music to prevent them from hearing the stimulus materials throughout the duration of the experiment. The music was highly effective in masking the test stimuli (see Kemler Nelson et al., in press).

Each session began with a "preparatory phase" in which infants were presented with musical stimuli. This was done to familiarize the infants with the lights on the sides of the testing booth, and to ensure that they were capable of making the required orienting response⁵. This phase continued until the infant accumulated 40 seconds of listening time to the musical stimuli. The loudspeaker from which the stimuli were emitted varied randomly from trial to trial. After the infant completed this initial phase of the experiment, the test phase began. Stimuli for the test phase consisted of the infant's name and the three foils which were designed according to the criteria discussed earlier. Test trials were blocked in groups of four. Each of the four names (the infant's own, along with the three foils) appeared once in a given block in random order. Each infant was tested on three blocks, completing twelve test trials in all.

⁵ Prior research using this procedure has demonstrated that infants at this age often fail to orient to their sides without some degree of prompting. This beginning phase was added to our study to deal with the possibility that infants would not spontaneously make the required orienting response. We chose musical rather than linguistic stimuli for this phase, so as not to influence responding during the test phase.

Table 1

INFANTS' NAMES

Aaron
Emily (2 infants)
Erin (2 infants)
Corey
Henry
Emmy
Joshua
Nick
Becca
Samantha
Travis
Phillip
Kyle
Abby
Steven
Sarah
Christopher
Brandon
Katie
Rachel
Cameron
Dana
JoJo

FOILS

Jessica Brandon
Eliza Elaine
Marissa Justine
Connor Christopher
Denise Samantha
Marie Meghan
Carol Kevin
Michelle Lorraine
Rumiz Jenna
Aaron Joshua
Michael Kyle
Kathleen Kathy
Nicole Meg
Darlene Audrey
Corey Bob
Maria Henry
Agatha
MiMi
Lavern
Lucy
Christine
Ben
Travis

RESULTS AND DISCUSSION

Mean listening times to each name in a given test session were calculated for each infant across the three blocks of trials. These means were then averaged for the infants' own names, and for each of the foils (same stress names, and each of the different stress names; see Table 2). Across all 24 subjects, the average listening times were 16.14 s ($SD = 5.49$ s) for the infants' own names, 13.03 s for names with the same stress pattern ($SD = 6.26$ s), and 12.17 s and 12.39 s for each group of the different stress names ($SD = 5.46$ s and $SD = 5.10$ s). An ANOVA revealed that these means were significantly different, with a main effect of name category ($F(3, 69) = 5.60, p = .0017$). Moreover, a series of planned comparisons indicated that infants demonstrated significant listening preferences for their own names when compared *both* to names with identical stress patterns ($t(23) = 2.64, p = .014$), *as well as* to names which followed opposite patterns ($t(23) = 3.98, p = .000$ and $t(23) = 3.54, p = .002$ for each group of oppositely patterned names). No other comparisons reached significance.

The present results indicate that by 4 1/2 months of age, infants recognize their own names. In addition, they prefer to listen to their own names even in the presence of prosodically similar foils. This suggests that by the age of 4 1/2 months, infants have a rather detailed representation of the sound patterns of their own names. They have learned to respond differentially to a particular sound pattern that will ultimately have special significance for them (Howarth & Ellis, 1961; Moray, 1959; Wood & Cowan, in press; Van Lancker, 1991). In this sense, they have taken a first step toward relating sounds to meanings. We believe these results have several important implications for understanding lexical development. There are indications in the literature on lexical development that the age at which words are acquired may influence subsequent word recognition processes in children (Walley, 1993). One interesting possibility is that the organization of the infant's early lexicon is influenced by the first lexical entries acquired. Because the infants' own names are very salient and frequently heard in their environment, it is possible that infants might be more likely to attend to words which share a structural relation to their own names. If this is the case, it might help to explain individual differences often found in early language development. In particular, some theorists have argued that the early productions of language-learning infants might be heavily influenced by the particular sounds that appear in the child's early lexicon (Vihman, 1993).

Although the infant's own name has potentially important consequences for early lexical development, it is certainly not the only word that could potentially influence early productions or lexical structure. It is also possible that infants might display similar recognition of other words that occur frequently in their language learning environments (e.g., other terms that relate to socially-salient persons, objects, or events). What remains to be determined is whether infants at this early stage of language learning might show similar recognition to these other salient items. Regardless of whether there are other such items that are learned even earlier than the infant's own name, the present results demonstrate that infants as young as 4 1/2 months of age are learning to recognize sound patterns that have a special personal significance for them. In this sense, infants display evidence of language comprehension well before previous estimates reported in the developmental literature (Benedict, 1979; Huttenlocher, 1974).

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