

## Research Article

SIX-MONTH-OLD INFANTS' PREFERENCE FOR  
LEXICAL WORDSRushen Shi<sup>1</sup> and Janet F. Werker<sup>2</sup><sup>1</sup>School of Audiology and Speech Sciences and <sup>2</sup>Department of Psychology, University of British Columbia, Vancouver, British Columbia, Canada

**Abstract**—Previous work has shown that newborn infants categorically discriminate the fundamental syntactic category distinction between lexical and grammatical words. In this article, we show that by the age of 6 months, infants prefer to listen to lexical over grammatical words. In Experiment 1, infants were habituated to a list of either lexical or grammatical words, and then tested on new lists of words from the same and the contrasting categories. The infants showed recovery to lexical words after habituation to grammatical words but not vice versa. This asymmetry indicates a possible preference for lexical words. In Experiments 2 and 3, preference was assessed directly by presenting infants with alternating trials of lexical and grammatical words, in the central-fixation preference procedure. The infants looked significantly longer during lexical-word than grammatical-word trials. These results show that by 6 months, infants attend preferentially to lexical words. The implications of this emerging attentional preference for subsequent language acquisition are discussed.

During the course of language acquisition, children must learn the meanings of words and be able to assign them to their appropriate syntactic categories, such as noun, verb, and preposition, in order to understand and produce multiword utterances in a systematic fashion. One possible way in which infants can break into the syntax of language is to first learn the meanings of some words and assign those words to the appropriate syntactic categories (Pinker, 1984). Once they have some knowledge of grammatical structure, they can use that structure to help infer the meanings of more words (Gleitman, 1990). But how do they begin this process? Some mileage is provided by infants' abilities to segment words from fluent speech (Jusczyk & Aslin, 1995), perhaps using statistical learning strategies (Saffran, Aslin, & Newport, 1996), and to map isolated words onto objects or events in the world (G. Schafer & Plunkett, 1998; Werker, Cohen, Lloyd, Casasola, & Stager, 1998; Woodward, Markman, & Fitzsimmons, 1994). Still, only some of the words that infants learn have possible word-to-world mappings—whether they be mappings that are easily imaginable, as for many concrete nouns (Gillette, Gleitman, Gleitman, & Lederer, 1999), or defined more abstractly, as for verbs, adverbs, and adjectives. Other words play a primarily grammatical role and are defined only in relation to other words in a sentential context. Thus, if infants are to begin the process of mapping words onto their underlying meanings, they need some means to ascertain just which words are likely to be involved in word-to-world mappings and which words are likely to contribute more to grammatical structure (see Gillette et al., 1999).

The binary distinction between lexical words and grammatical

words captures this important difference between words that carry meaning and those that contribute primarily to structural relations. Lexical categories include open-class items that have a high semantic load, such as nouns, verbs, adjectives, and adverbs. Grammatical categories include items such as auxiliaries, prepositions, postpositions, and modal particles, which are more involved in structure and convey meaning only in relation to the lexical words in a sentence. Whereas more refined syntactic categories may be language-specific (e.g., Mandarin has postpositions but English does not), the binary distinction between the superordinate categories of lexical and grammatical words is basic in all human languages.

Recent work (Morgan, Shi, & Allopenna, 1996; Shi, 1995/1996; Shi, Morgan, & Allopenna, 1998) has shown that input speech to infants across typologically distinct languages contains universal perceptual cues to lexical and grammatical words. Grammatical words are acoustically and phonologically reduced compared with lexical words, have simpler syllable form, and have a different distribution of phonotactics and vowel types. In addition, there are substantially fewer types of grammatical than lexical words, but the common grammatical words (e.g., *the*, *a*, and *and*) tend to be used with overwhelmingly greater frequency than are the most common lexical words. No single cue is sufficient to capture the difference between these two fundamental syntactic categories, but with a set of multiple probabilistically occurring cues, Kohonen network simulations were able to classify words successfully into lexical and grammatical categories (Morgan et al., 1996; Shi, 1995/1996; Shi et al., 1998).

Recently, we showed that newborn infants, who have minimal experience with language, are able to use these probabilistic cues to categorize lexical versus grammatical words (Shi, Werker, & Morgan, 1999). Using a high-amplitude sucking procedure, we habituated neonates to a list of lexical or grammatical words and then, following habituation, tested them on a new list of words from either the same category or the other category. Newborns' sucking rate showed significantly greater recovery to a new category of words than to a new list of words from the same category. Newborns showed this ability even when the words were from an unfamiliar language. These findings indicate that infants are born with perceptual biases and learning mechanisms that allow them to use probabilistically occurring acoustic and phonological cues to divide words into the two categories that correspond to fundamental syntactic distinctions.

Neonates' ability to categorically discriminate lexical from grammatical words does not imply that they have "knowledge" of the grammatical categories of languages, but it does indicate that they have a set of acoustic-perceptual biases that could provide a starting point for eventually breaking into syntax, and thus into language. However, this ability could also simply reflect a set of acoustic-perceptual biases that operate only in the newborn period and bear no relation to eventual language learning. In this study, we explored this question. We investigated how 6-month-old infants, who have had a substantial amount of exposure to their native language, perceive

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**Table 1.** *Stimuli for Experiment 1*

## Lexical-Word List 1 (38 items)

taste\*<sub>3</sub>, showing\*<sub>2</sub>, play\*<sub>3</sub>, chew\*<sub>3</sub>, found\*<sub>3</sub>, again\*<sub>2</sub>, going\*<sub>2</sub>, mommy\*<sub>A</sub>\*<sub>2</sub>, mommy\*<sub>B</sub>\*<sub>3</sub>, hide\*<sub>A</sub>\*<sub>3</sub>, mommy's\*<sub>A</sub>\*<sub>3</sub>, cookie\*<sub>A</sub>\*<sub>3</sub>, chair\*<sub>A</sub>\*<sub>3</sub>, find\*<sub>A</sub>\*<sub>3</sub>

## Lexical-Word List 2 (38 items)

toys\*<sub>3</sub>, read\*<sub>3</sub>, new\*<sub>3</sub>, hear\*<sub>2</sub>, bounced\*<sub>3</sub>, ernie\*<sub>3</sub>, great\*<sub>3</sub>, ball\*<sub>1</sub>, hide\*<sub>3</sub>, mommy's\*<sub>B</sub>\*<sub>3</sub>, cookie\*<sub>B</sub>\*<sub>2</sub>, chair\*<sub>B</sub>\*<sub>3</sub>, find\*<sub>B</sub>\*<sub>3</sub>, mommy's\*<sub>C</sub>\*<sub>3</sub>

## Grammatical-Word List 1 (42 items)

in\*<sub>A</sub>\*<sub>3</sub>, in\*<sub>B</sub>\*<sub>3</sub>, a\*<sub>A</sub>\*<sub>3</sub>, a\*<sub>B</sub>\*<sub>3</sub>, you\*<sub>A</sub>\*<sub>3</sub>, you\*<sub>B</sub>\*<sub>3</sub>, you\*<sub>C</sub>\*<sub>3</sub>, you\*<sub>D</sub>\*<sub>3</sub>, you\*<sub>E</sub>\*<sub>3</sub>, its\*<sub>3</sub>, the\*<sub>A</sub>\*<sub>3</sub>, the\*<sub>B</sub>\*<sub>3</sub>, your\*<sub>A</sub>\*<sub>3</sub>, your\*<sub>B</sub>\*<sub>3</sub>

## Grammatical-Word List 2 (42 items)

in\*<sub>C</sub>\*<sub>3</sub>, in\*<sub>D</sub>\*<sub>3</sub>, a\*<sub>C</sub>\*<sub>3</sub>, a\*<sub>D</sub>\*<sub>3</sub>, a\*<sub>E</sub>\*<sub>3</sub>, you\*<sub>F</sub>\*<sub>3</sub>, you\*<sub>G</sub>\*<sub>3</sub>, you\*<sub>H</sub>\*<sub>3</sub>, you\*<sub>I</sub>\*<sub>3</sub>, you\*<sub>J</sub>\*<sub>3</sub>, you\*<sub>K</sub>\*<sub>3</sub>, you\*<sub>L</sub>\*<sub>3</sub>, we\*<sub>3</sub>, that's\*<sub>3</sub>

*Note.* Words were mimicked from an audio recording of a mother speaking to her infant. The number following each word indicates the number of times that word was mimicked. Subscripts are used to identify words that occurred in different sentences (i.e., different tokens); across the tables in this article, a given subscript identifies the same token. The items in each list were presented in random orders that differed across infants.

lexical and grammatical words. We asked specifically if the categorical discrimination evident in the neonatal period is still evident at 6 months of age, and if so, whether it is being harnessed in any way that might be of more direct relevance for breaking into language. To address these questions, in Experiment 1 we asked whether 6-month-old infants still categorically discriminate lexical and grammatical words, as the newborns did in our previous work. In Experiments 2 and 3, we tested whether 6-month-olds prefer to listen to grammatical words, which occur more frequently, or to the more salient, semantically loaded lexical words.

## EXPERIMENT 1

A habituation-dishabituation paradigm was used to test if 6-month-old infants categorically discriminate lexical and grammatical words. In our newborn study (Shi et al., 1999), infants were tested with a high-amplitude sucking procedure, but this procedure is not usable with infants older than 2 months. To make the test appropriate for 6-month-olds, we used a visual-fixation procedure, in which looking time to a visual image is the dependent variable.

### Method

#### *Participants*

Full-term, healthy, monolingual English-learning infants were recruited 1 to 3 days after birth at the postpartum units of the British Columbia Women's Hospital, Vancouver, and were contacted when they reached 6 months of age. Thirty-two infants (14 male, 18 female) completed the study (mean age = 6 months, 17 days; range: 6 months, 0 day to 6 months, 28 days). The data for 28 other infants were excluded.<sup>1</sup>

1. Of these infants, 5 failed to habituate, 3 were fussy, 9 did not show recovery during the posttest novel trial, 4 were excluded because of experimenter errors, and 7 were excluded because of hardware or software failure.

#### *Stimuli*

The auditory stimuli were the same as those in Shi et al. (1999).<sup>2</sup> They consisted of two lists of lexical words (e.g., *chew*, *hide*, *chair*) and two lists of grammatical words (e.g., *the*, *you*, *that*), which were originally randomly selected from an audio recording of the natural speech of an English-speaking mother to her infant. In each of the four lists, there were 38 to 42 word tokens (see Table 1).

#### *Procedure and design*

The infants were tested individually in a visual-fixation habituation procedure. Each infant was seated on his or her parent's lap in front of a television monitor and loudspeaker. During trials, the auditory stimuli were presented together with a visual display of a black-and-white checkerboard. Each trial was initiated upon the infant's fixation, and terminated when the infant looked away from the checkerboard for more than 0.5 s, or after 16 s had elapsed. If the infant was looking away after a trial ended, a flashing light was presented to attract his or her attention so that the next trial could begin. The parent wore headphones delivering music to mask the auditory stimuli. The experimenter observed the infant in an adjacent room through a video camera and pressed a computer key whenever an eye fixation occurred. During the habituation phase, the computer program averaged looking time for each consecutive three-trial block and computed the ratio of the looking time in each later block to that for the first block. The infant was determined to have reached habituation when the average looking time for a block was 66% or less than that for the first block. Upon habituation, the program automatically shifted to the test phase.

Half the infants (16) were habituated to lexical and half to grammatical words. In the test phase, each infant was presented with two word lists: A novel list of words from the same category heard during the habituation phase was presented on one test trial (*same* trial), and

2. As explained in Shi et al. (1999), to avoid unnaturalness of excised words from coarticulated sentential contexts, the stimuli were reproduced by another female speaker who mimicked the original utterance as closely as possible, but introduced a brief silence before and after each target word. Acoustical analyses were performed to ensure that the reproductions preserved the essential characteristics of the original words (see Shi et al., 1999).

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a novel list of words from the contrasting category was presented on the other test trial (*switch* trial). The habituation condition (grammatical vs. lexical words), the word lists, and the order of same and switch trials were counterbalanced, yielding 16 configurations. Two infants were tested in each configuration.

Upon trial initiation, word tokens from the appropriate list were presented randomly. The interstimulus interval was 1 s. To reduce variability in looking time during the first trial, we included a pretest trial that presented sequences of sine wave speech analogues. An identical posttest trial allowed verification of whether the infants were still paying attention to the task during the test phase. Infants whose posttest looking time was shorter than the average of the last block of the habituation phase were excluded from data analysis.

We expected that if 6-month-old infants categorize words into grammatical versus lexical classes, they would show renewed interest (increased looking time) to the switch but not the same trials during the test phase.

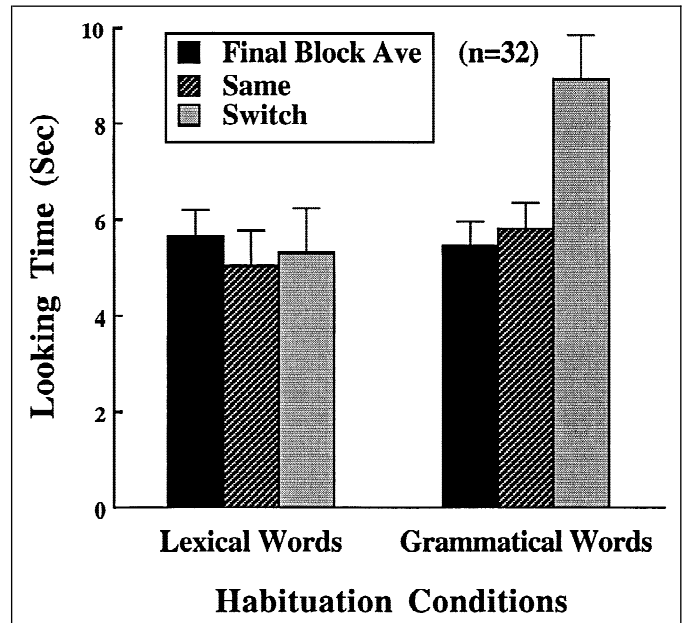
### Results and Discussion

There were no significant differences in the total looking time across trials during the habituation phase. That is, infants in the two habituation conditions (i.e., lexical or grammatical words) had equivalent exposure during the familiarization phase. Looking time during the final habituation block (i.e., the average of the last three trials of habituation) and each of the test trials was analyzed in a 2 (habituation condition: lexical vs. grammatical category)  $\times$  3 (trial type: final habituation block vs. same trial vs. switch trial) mixed analysis of variance (ANOVA). The results indicated a main effect for both habituation condition,  $F(1, 30) = 4.23, p < .05$ , and trial type,  $F(2, 60) = 4.53, p < .02$ , and also a significant interaction between habituation condition and trial type,  $F(2, 60) = 5.02, p < .01$ . Tukey tests ( $p = .05$ ) specifically comparing the trial types showed that for infants habituated to grammatical words, there was a significant difference in looking time between the switch trial and both the same trial and the final habituation block, but not between the same trial and the final habituation block (see Fig. 1). Among infants habituated to lexical words, no significant differences between trial types were present.

Unlike the newborns in our previous study, who increased their sucking rate upon hearing words of a different category regardless of the habituation condition (Shi et al., 1999), the 6-month-olds in the current study looked longer only to hear lexical words after being habituated to grammatical words. They did not look longer to hear grammatical words after being habituated to lexical words.

There are two possible explanations for these results. First, the asymmetrical response pattern may suggest that 6-month-old infants are not able to fully discriminate lexical and grammatical words. If this were so, it would be perplexing why they fail to do so at 6 months but succeed at birth (Shi et al., 1999).

An alternative explanation is more intriguing: Rather than showing failure to discriminate the two categories, the 6-month-olds, in this experimental procedure, may have exhibited a preference for lexical over grammatical words. It has been previously suggested that asymmetrical recovery to auditory and visual stimuli may indicate preference for one stimulus type over another (Caron, Caron, & Myers, 1982; Malcuit, Pomerleau, & Lamarre, 1988; Mehler, Bertoncini, & Barrierer, 1978; Pegg, Werker, & McLeod, 1992). The possibility that infants prefer to listen to lexical words is not unreasonable given that



**Fig. 1.** Infants' looking time (with standard error bars) in Experiment 1. In the test phase, infants were presented with two word lists: a novel list of words from the same category heard during the habituation phase (i.e., same trial) and a novel list of words from the contrasting category (i.e., switch trial). Results for the final habituation block, same trials, and switch trials are shown as a function of habituation condition. Ave = average.

it is well known that lexical words are attended to and processed differently from grammatical words by older children and adults. When children first combine words (typically around 18 to 24 months), they tend to "telegraphically" include lexical words while omitting grammatical words (Brown & Fraser, 1963). Adults make more errors identifying sounds (or letters) in grammatical than in lexical words in sentences (Rosenberg, Zurif, Brownell, Garrett, & Bradley, 1985). Repetitions of grammatical words often elude proof-readers of all ages (the spelling checkers in word processors note such repetitions precisely because these errors are both common and difficult to detect). These observations suggest that more conscious processing is devoted to lexical than grammatical words; grammatical words are treated as less salient than lexical words, both in meaning and in acoustic and phonological form. Hence, the asymmetry we observed in Experiment 1 may be the precursor of these later differences in processing: At an age as early as 6 months, infants may be showing preference for lexical words.

### EXPERIMENT 2

The purpose of this experiment was to test directly whether 6-month-old infants prefer to listen to lexical over grammatical words.

#### Method

##### Participants

Thirteen full-term, healthy, monolingual English-learning infants were recruited as in Experiment 1. Twelve infants completed the study

(5 male, 7 female; mean age = 6 months, 12 days; range: 6 months, 0 day to 6 months, 22 days); 1 did not because of fussiness.

### Stimuli

The auditory stimuli were the same as those in Experiment 1, except there were two word lists instead of four. The two lexical-word lists were combined to form one lexical list, and the two grammatical-word lists were combined to form one grammatical list (see Table 2). Upon trial initiation, word tokens from one of the two lists were presented randomly until the prespecified trial length was reached.

### Procedure

The equipment setup, infant and parent seating, and on-line recording were the same as in Experiment 1. In this experiment, however, the infants were tested in a central-fixation preference procedure (see Cooper & Aslin, 1990). Ten trials were presented, alternating five trials each of lexical and grammatical words, with order of trials counterbalanced. Each 16-s trial was initiated upon the infant's fixation. The auditory stimuli and checkerboard were presented for the whole trial duration. The computer recorded looking time on each trial; if there were multiple looks toward the checkerboard during a trial, the computer automatically calculated the total looking time for that trial.

### Results and Discussion

To assess preference, we compared each infant's looking time while listening to lexical words with his or her looking time while listening to grammatical words. Following Cooper and Aslin (1990), for each infant, we calculated average looking times across lexical- and grammatical-word trials separately. A mixed  $2 \times 2$  ANOVA was performed with order (lexical words first vs. grammatical words first) as the between-subjects factor and word category (lexical vs. grammatical words) as the within-subjects factor. The results revealed a significant main effect of word category,  $F(1, 10) = 8.765, p = .0143$  ( $M = 13.07$  s for lexical words,  $M = 12.067$  s for grammatical words), but no other significant main effects or interactions. As is standard with this procedure, we conducted an additional mixed ANOVA with the duration of the first trial removed (Cooper, Abraham, Berman, & Staska, 1997; Cooper & Aslin, 1994). Again, there was a significant main effect of word category,  $F(1, 10) = 8.6, p =$

.015, but no other significant results. An analysis of the first trial revealed no difference between mean looking times (across subjects), with equivalent looking time occurring whether lexical words or grammatical words were presented first,  $t(10) = 0.217, p = .8325$ . Therefore, either with or without the unstable first trial, infants listened longer to lexical words.

These analyses reveal that 6-month-old infants do prefer lexical over grammatical words. The results from this study, which used a direct preference procedure, confirm those of Experiment 1. It appears that by 6 months, infants begin to use an active listening strategy, and listen preferentially to lexical words.

Because the word tokens in Experiments 1 and 2 were selected randomly from a mother's spontaneous speech to her infant, the type/token ratio was higher for lexical words than for grammatical words; moreover, the lexical words included both monosyllabic and disyllabic words, whereas the grammatical words were all monosyllabic. To reflect the characteristics of natural speech input, we decided to keep these differences in Experiments 1 and 2. It is possible, however, that infants' preference for lexical words in these experiments was based on the greater variability in word types and number of syllables in the lexical words. We therefore conducted an additional experiment in which both the type/token ratio and the number of syllables were explicitly balanced for lexical- and grammatical-word lists.

## EXPERIMENT 3

In Experiment 3, we tested if 6-month-old infants would prefer to listen to lexical over grammatical words even when two of the distinguishing, but potentially confounding, cues were removed.

### Method

#### Subjects

Thirteen full-term, healthy, monolingual English-learning 6-month-olds were recruited as in Experiment 1. Twelve infants completed the study (5 male, 7 female; mean age = 6 months, 17 days; range: 6 months, 3 days to 6 months, 27 days); 1 did not because of fussiness.

#### Stimuli

The auditory stimuli were a subset of the words used in Experiment 2. The two lists, one lexical and one grammatical, each con-

**Table 2.** Stimuli for Experiment 2

#### Lexical-Word List (76 items)

taste\*3, showing\*2, play\*3, chew\*3, found\*3, again\*2, going\*2, mommy<sub>A</sub>\*2, mommy<sub>B</sub>\*3, hide<sub>A</sub>\*3, mommy's<sub>A</sub>\*3, cookie<sub>A</sub>\*3, chair<sub>A</sub>\*3, find<sub>A</sub>\*3  
toys\*3, read\*3, new\*3, hear\*2, bounced\*3, ernie\*3, great\*3, ball\*1, hide\*3, mommy's<sub>B</sub>\*3, cookie<sub>B</sub>\*2, chair<sub>B</sub>\*3, find<sub>B</sub>\*3, mommy's<sub>C</sub>\*3

#### Grammatical-Word List (84 items)

in<sub>A</sub>\*3, in<sub>B</sub>\*3, a<sub>A</sub>\*3, a<sub>B</sub>\*3, you<sub>A</sub>\*3, you<sub>B</sub>\*3, you<sub>C</sub>\*3, you<sub>D</sub>\*3, you<sub>E</sub>\*3, its\*3, the<sub>A</sub>\*3, the<sub>B</sub>\*3, your<sub>A</sub>\*3, your<sub>B</sub>\*3  
in<sub>C</sub>\*3, in<sub>D</sub>\*3, a<sub>C</sub>\*3, a<sub>D</sub>\*3, a<sub>E</sub>\*3, you<sub>F</sub>\*3, you<sub>G</sub>\*3, you<sub>H</sub>\*3, you<sub>I</sub>\*3, you<sub>J</sub>\*3, you<sub>K</sub>\*3, you<sub>L</sub>\*3, we\*3, that's\*3

*Note.* Words were mimicked from an audio recording of a mother speaking to her infant. The number following each word indicates the number of times that word was mimicked. Subscripts are used to identify words that occurred in different sentences (i.e., different tokens); across the tables in this article, a given subscript identifies the same token. The items in each list were presented in random orders that differed across infants.



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tained only monosyllabic word tokens and were balanced in both the number of types and the number of tokens within each type (see Table 3).

### Procedure

The procedure was the same as in Experiment 2.

### Results

As in Experiment 2, average looking times across lexical trials and across grammatical trials were calculated separately for each infant. A mixed  $2 \times 2$  ANOVA was performed with order (lexical words first vs. grammatical words first) as the between-subjects factor and word category (lexical words vs. grammatical words) as the within-subjects factor. The results revealed a significant main effect of word category,  $F(1, 10) = 10.821, p = .0082$  ( $M = 11.872$  s for lexical words,  $M = 10.877$  s for grammatical words), and a significant Order  $\times$  Word Category interaction,  $F(1, 10) = 7.743, p = .0194$ . As in Experiment 2, we conducted a second ANOVA with the duration of the first trial removed. There was again a significant main effect of word category,  $F(1, 10) = 5.384, p = .0427$ , but no significant Order  $\times$  Word Category interaction,  $F(1, 10) = 0.898, p = .3657$ . Thus, with the unstable first trial removed, a preference for lexical over grammatical words was confirmed. An analysis of the first trials revealed no significant differences in mean looking time (across subjects),  $t(10) = 0.495, p = .6316$ . These results replicate and extend those of Experiment 2, and show that even when two distinguishing cues (type/token ratio and number of syllables) are removed, 6-month-old infants still prefer to listen to lexical over grammatical words.

## GENERAL DISCUSSION

It is known that newborns categorically discriminate lexical versus grammatical words, showing a perceptual sensitivity to the acoustic and phonological cues that distinguish the two most basic syntactic categories (Shi et al., 1999). In this set of experiments, we explored how 6-month-old infants, who have had a substantial amount of exposure to their native language, perceive lexical and grammatical words. Specifically, we asked if the categorical discrimination evident in the neonatal period is being harnessed at 6 months of age in a way that might be of more direct relevance for breaking into language. The results of this set of experiments indicate that between birth and 6 months of age, experience does play a role in word processing. The symmetrical discrimination between grammatical and lexical words

evident in newborn infants is no longer present by 6 months of age. Instead, it is replaced by a preference for lexical over grammatical words—a preference that is evident even when two of the most salient cues to the category distinction are removed. When tested in a habituation procedure, 6-month-old infants showed a significant recovery to the change from grammatical to lexical words, but no recovery to a change in the reverse direction. When tested in a direct preference procedure, 6-month-olds listened longer to lexical words than to grammatical words. This effect was still present when type/token ratio and syllable number were controlled.

The emerging preference for lexical words is particularly striking because in input speech, the frequency of occurrence of most grammatical words is higher than the frequency of occurrence of most lexical words. The preference could be because lexical words are more salient and interesting acoustic and phonological forms than are grammatical words. They tend to be longer, have full vowels, and have more complex syllable structure, and may therefore be more variable than grammatical words. Familiarity may also play a role because words that occur in isolation in mothers' speech are almost exclusively lexical words (Shi et al., 1998). We are currently investigating whether acoustic-phonological complexity or familiarity contributes most to this preference.

The age-related change from categorical discrimination of lexical versus grammatical words in the newborn period to a preference for lexical over grammatical words by 6 months of age suggests a link between the initial biases shown in the newborn period and the subsequent use to which these perceptual and learning abilities might be put. The emerging preference may help infants begin to learn more about lexical words. First, as infants must ultimately learn the refined syntactic categories, such as nouns and prepositions, the greater attention to lexical words may help limit their scope of analysis so that they may more effectively focus on the refined subcategories within the lexical category. Second, the preference for lexical words may assist infants in their word learning. Indeed, there is evidence that by 7 1/2 months of age, infants begin to recognize familiar word forms in the input (Jusczyk & Aslin, 1995; Jusczyk & Hohne, 1997). Moreover, by 8 months of age, infants show the first signs of comprehending the meanings of common words (Fenson et al., 1994). But in all studies to date, it is lexical, not grammatical, words that infants have been shown to begin to recognize and understand at this early age. Although grammatical words are also critical in language acquisition (Gerken, 1996) and may play a necessary role in speech segmentation even in infancy (Christophe, Guasti, Nespor, Dupoux, & Ooyen, 1997; Morgan et al., 1996), our work indicates that 6-month-olds pay greater attention to lexical words. Indeed, it is not until 11 months of age that infants detect substitutions of grammatical words in utterances (V.L. Schafer, Shucard, Shucard, & Gerken, 1998).

**Table 3.** Stimuli for Experiment 3

#### Lexical-Word List (24 items)

toys\*3, chew\*3, chair<sub>A</sub>\*2, chair<sub>B</sub>\*1, find<sub>A</sub>\*2, find<sub>C</sub>\*1, great\*3, play\*3, bounced\*3, hide<sub>A</sub>\*2, hide<sub>B</sub>\*1

#### Grammatical-Word List (24 items)

its\*3, the\*3, in<sub>A</sub>\*2, in<sub>B</sub>\*1, your<sub>A</sub>\*2, your<sub>B</sub>\*1, we\*3, that's\*3, a\*3, you<sub>A</sub>\*2, you<sub>B</sub>\*1

*Note.* Words were mimicked from an audio recording of a mother speaking to her infant. The number following each word indicates the number of times that word was mimicked. Subscripts are used to identify words that occurred in different sentences (i.e., different tokens); across the tables in this article, a given subscript identifies the same token. The items in each list were presented in random orders that differed across infants.

How might an emerging preference for lexical words assist language acquisition? We suggest it could provide a perceptual route into both syntactic (Gleitman, 1990) and semantic (Pinker, 1984) bootstrapping. The movement from categorical discrimination to preference for lexical words could provide the first differential syntactic analysis. It could also allow infants to focus more on those words that carry meaning than on the grammatical words that carry primarily structure, and thus prepare them, shortly after 6 months of age, to begin to recognize (Jusczyk & Aslin, 1995) and even to learn the meaning of (Fenson et al., 1994) some common lexical words. The preference for lexical words could thus better enable children to begin to discover the meanings of individual words to bootstrap into grammar (Pinker, 1984), and the syntactic categories of words to bootstrap into meaning (Gleitman, 1990). The evolution in perceptual processing of lexical and grammatical words from an initial perceptually based categorical discrimination of these two types of words to an emerging attentional preference for lexical words may thus play a critical role in the acquisition of language.

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