WORD RECOGNITION BY JAPANESE INFANTS


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ABSTRACT

Building a lexicon is a necessary step in the process of language acquisition. The emergence and development of vocabulary have usually been observed in naturalistic settings through their external manifestation: the first attempts at producing words, and the various signs showing that an infant comprehends words. Naturalistic approaches, however, may underestimate the productive lexicon on one hand, and overestimate the receptive lexicon on the other hand. An experimental approach, using the Headturn Preference Procedure, has been used to show that 11- to-12-month-old French infants can recognize familiar words without specific training (Halle and Boysson-Bardies, 1994). The spontaneous preference for familiar words, interpreted as word recognition, revealed the formation of an early receptive lexicon comprising a significant part of the familiar words that were used. At 12 months, recognition seemed to be firmly established, while it seemed to be just emerging at 11 months. Using the same procedure, the present study examined familiar word recognition in Japanese infants: Twelve-month-olds, but not 10-month-olds, showed a preference for familiar words, similar in intensity to that shown by 11-month-old French infants. These results are again interpreted as revealing the formation of a nascent receptive lexicon in Japanese infants by 12 months of age. Commonalities and differences between the two language groups are discussed.

1. INTRODUCTION

Before they can produce words, young children are often thought to understand some speech in certain familiar situations. But they are probably aided by various contextual cues provided by imitation, situation, behavioral routines, and so forth. Hence, observational studies perhaps overestimate infants’ capacities to understand words and should be considered with some caution. Observational studies (Benedict, 1979; Hultenlocher, 1974; Harris, Yeades, Chassin, and Oakley, 1995) suggest that the onset of word comprehension occurs by 9-10 months. Recently, a wide range study based on parental reports of children aged from 8 to 16 months found that 8-month-olds are credited with understanding as many as 36 words on the average (Bates, Dale, and Thal, 1995). Interpretations of these data in terms of linguistic word comprehension may, however, be optimistic. As Bates et al. acknowledge, parents may ‘infer’ comprehension from nothing more than evidence for high attention and positive affect.* Indeed, it has been suggested that young infants who seem to comprehend a word in a naturalistic setting respond to the word sound-pattern plus the situation: Infants might not use, at this stage, representations of word s based on a purely linguistic code. In contrast to the optimist view, a few studies conducted in controlled laboratory settings have detected the onset of word comprehension no earlier than 12-13 months (Thomas, Campos, Shucard, Ram-say, and Thomas, 1981; Ovitt, 1980). However, ERP studies provide indirect evidence of a differential processing of known versus unknown words at earlier ages: 12 months (Möller, Wetzel, and Góll, 1993) or even 10 months for “early comprehenders” (Mills, Colley, and Neville, 1993).

More recently, recognition (not necessarily comprehension) of words thought to be familiar to French infants in their environment, has been shown in an experimental situation from the age of 10 1/2 months by Halle and Boysson-Bardies (1994), using a head turn preference procedure. Words were presented to children without any situational or intentional cues, so that word recognition could only be based on the sound pattern alone, that is, presumably, on a linguistic code. An underlying hypothesis was that despite some individual variability, a “core set” of words, heard in infants’ environment in various referential situations, would be shared by most infants. Indeed, Halle and Boysson-Bardies’ (1994) results supported this hypothesis: Items in a core set of frequently attempted familiar words were preferred over rare words by 12-month-old as well as by 11-month-old French infants. Factors such as prosodic contour and phonetic complexity were controlled so that word recognition rather than preference for appealing sounds could be inferred from the results. Importantly, infants received no controlled training on familiar words during or before the experimental sessions: They recognized words they already knew. Therefore, the ability to recognize familiar words appears to be based on stable word representations, which children have formed in the natural conditions of daily life. A further study investigated what sort of representational format French infants use to code familiar words and found that a rather holistic format was probably used for the words of early receptive lexicons (Halle and Boysson-Bardies, in press).

The question addressed in the present study is of the generality and the replicability of these results: Will infants learning a different language show the same ability at recognizing familiar...
words as French infants? Of course, at some point in the course of language acquisition, the answer eventually must be a qualified "Yes". But the question is also when and how, according to the different characteristics of the languages being learned, and, perhaps, to the different cultural habits.

We investigated word recognition in Japanese infants, using the same experimental paradigm as for French infants: Preference for familiar words over rare words, as indexed by attention span, would show recognition. Since familiar word recognition seemed to emerge by 11 months for French infants, we tested two age groups around that age: 10 months and 12 months.

2. EXPERIMENT

2.1. Method

Stimuli. We used 12 familiar and 12 rare words (see Appendix). Familiar words were mostly drawn from a previous longitudinal and cross-linguistic production study, where, in particular, the productive lexicon of 5 Japanese infants were examined from about 14 months until 21 months (Boysson-Bardies and Vilman, 1991). The adult glosses of the most frequent attempts at words encountered in this study were taken as familiar words. Also, since most Japanese infants' productions, according to this study, were bisyllables, only bisyllabic stimuli were retained. Rare words were chosen among words infrequent in Japanese. Care was taken to avoid word form closeness of each rare word to any possible familiar word so that the two sets could not likely be confounded. The two sets were approximately matched in phonetic complexity on the basis of Sawaki's data (1980) on spoken Japanese. These data allowed for an estimation of syllable frequencies in spoken Japanese. The two sets did not differ with respect to the first and second syllable frequencies (first syllable: 6.2% vs. 5.8% for familiar vs. rare words, \( \chi^2(2) < 1 \); second syllable: 18.2% vs. 14%, \( \chi^2(2) < 1 \)). Familiar and rare words were also equated for word accent (8 initially falling and 4 initially rising contours in both sets) and for various structural aspects, as summarized in Table 1.

<table>
<thead>
<tr>
<th></th>
<th>familiar words</th>
<th>rare words</th>
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<tbody>
<tr>
<td>open syllables</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>close syllables</td>
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<tr>
<td>Diphthongues</td>
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<td>Long vowels</td>
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<td>Geminates (( \ddot{Q} ))</td>
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<td>2</td>
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</tr>
<tr>
<td>nb. of phonemes</td>
<td>4.5</td>
<td>4.4</td>
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</tbody>
</table>

Table 1: Structural match between familiar and rare words.

The frequency of usage of the word stimuli was controlled using several sources, mainly Nakamichi (1977), Owada and Nakamichi (1972), both treating infant-directed speech, and Shibé's data on spoken Japanese (1980). A mean frequency of about 1% was found for familiar words (infant-directed speech: 0.95% out of 94,000 tokens; adult casual speech: 0.83% out of 8,000 tokens), while no occurrence of the rare words was found in these corpora.

The materials were recorded by a Japanese woman at an even tempo and intensity, and with a natural intonation, avoiding 'baby talk' speaking style. Six pseudo-random lists were constructed with the 12 familiar words. These were 'familiar lists'. Likewise, six 'rare lists' were constructed. Different lists began with a different couple of words. All lists were about 16 seconds in duration. There was no overall difference between familiar and rare words in F0 contour, intensity, or duration.

Subjects. Twenty-four infants in each age-group were tested. Infants in the 10-month group had a mean age of 10 months and 12 days (range = 10.01-10.30, SD = 10 days); in the 12-month group, the mean age was 12 months and 12 days (range = 12.00-10.30, SD = 8 days). There were 12 girls and 12 boys in the younger group, 10 girls and 14 boys in the older group. Eight additional subjects were run but could not be tested successfully. All subjects had a normal perceptual and motor development.

Apparatus and Procedure. The experimental setting was similar to that used in Hallé and Boysson-Bardies (1994) study. The subject sat on a parent's lap in the center of a three-sided booth. A lamp and a loudspeaker were mounted on each side panel at infant's eye level. A third lamp in the center of the front panel served to call the infant's gaze to the center direction before each trial. A hidden camera allowed for observing the infant and measuring looking times from a remote control room which was sound insulated from the test booth.

An experimental session consisted in a familiarization phase and a test phase. For each subject, familiar words were always played on one side, rare words on the other side. In both phases, the same type of list was presented first. The two factors Side assigned to familiar words and Type of the first list were counterbalanced across subjects. The familiarization phase was intended to acquaint the subject with the side assigned to each type of list. Two lists of one type were presented first, then two lists of the other type. In the test phase, 6 lists of each type were presented, whose type was randomly changed after the first list with the restriction that no more than 2 lists of the same type could occur in a row.

A given trial consisted of the presentation of a list. Once the infant's gaze was directed to the center lamp, the lamp on one side was turned on, and a list of words was played on that side. The trial was terminated if the infant did not start orienting to the
lamp after 4 seconds had elapsed, or stopped orienting for more than 2 seconds. Looking times to the list currently played was recorded by the observer, using a customized key box. The observer could not hear which words were played; the parent listened to music over headphones to avoid influencing the infant.

3. RESULTS

The results of the test phase are summarized in Figure 1. In the 10-month group, the mean looking times per trial were 6.58 s for familiar and 6.26 s for rare words ($SD = 2.78$ and 2.53, respectively). This difference was not significant, $t(23) < 1$. In the 12-month group, means were 8.28 s for familiar and 6.55 s for rare words ($SD = 3.14$ and 2.88 respectively). This difference was significant, $t(23) = 2.53$, $p = .018$. Analyzing the preference ratio for familiar words (defined as the proportion of looking time to familiar words) is another way to look at the data. In the 10-month group, the mean preference was 0.51, not significantly above the chance level 0.5, $t(23) < 1$; it was 0.56 in the 12-month group, significantly above chance, $t(23) = 2.43$, $p = .022$.

![Image](https://via.placeholder.com/150)

**Figure 1:** Mean looking times per trial: 10- and 12-month-olds.

An analysis of variance was conducted on the 12-month group test data. Looking times to familiar and to rare words were taken as dependent variables, treated as within-subject repeated measures. Between subjects independent factors were Side and Type (see above). Looking times were longer to familiar than to rare words, $F(1, 20) = 7.63$, $p = .012$. No significant effect of Side or Type was found. However, the Side x Type interaction approached significance, $F(1, 20) = 3.32$, $p = .081$: Preference was more marked when the first list was presented on the right side (0.62 vs. 0.51 preference ratios). Preference for familiar words was observed in the familiarization data (5.77 s vs. 4.72 s for familiar vs. rare words), but only approached significance, $t(23) = 1.26$, $p = .114$. In the 10-month group, there was no sign of a preference for familiar words in the familiarization phase: 4.25 s vs. 4.88 s for familiar vs. rare words. In this phase, 10-month-olds actually attended more to the first two lists that were presented than to the other two lists (5.83 s vs. 3.51 s per list, $t(23) = 3.85$, $p = .001$). A similar trend in the test phase (6.88 s vs. 5.96 s) was not significant, $t(23) = 1.46$, $p = .15$. Finally, no significant difference was found between girls and boys in both age-groups.

4. DISCUSSION

This study indicates that 12-month-old, but not 10-month-old Japanese children, show spontaneous recognition of some familiar words they probably often encounter in daily life. These words must be part of a receptive lexicon whose underlying representation s are purely linguistic since no extra-linguistic cues were offered to children to recognize word forms. These findings are thus adding weight to the previous research on word recognition by French infants. It seems, however, that the Japanese data somewhat differ from the French data with respect to the age where word recognition capacities are detected: The preference for familiar over rare words is found to be similar in intensity in French 11-month-olds and in Japanese 12-month-olds (0.56 preference ratios in both cases). Does this mean that French infants are one month ahead of Japanese infants in their linguistic development? Of course, such a conclusion is *prima facie* implausible. So what could explain the differences found? One possibility is that Japanese and French infants may react differently to the laboratory setting situation: French infants were perhaps more accustomed to laboratory testing. Differences in the experimental design were probably negligible and do not offer a tempting explanation for discrepancies. We may find a more convincing source of difference in the materials used. The critical point in the paradigm used to test word recognition via preference for familiar over rare words is the familiarity contrast between the two types of words. It is difficult to compare this contrast across two languages, and it could have been the case that (a) familiar words were 'less familiar' in the Japanese study, or (b) rare words were 'less rare'. Also, because children seem to code words as rather holistic shapes (Hikik and Boysson-Bardies, in press), the possibility of confusions between rare and familiar words cannot be dismissed, although care was taken to avoid phonetic similarity. Were such confusions more likely in the Japanese material? Rare words were otherwise very rare indeed in both Japanese and French materials, and we are more inclined to look at familiar words for a possible difference. Indeed, early lexicons differ across languages with respect to their semantic content. Boysson-Bardies (1996) has recently reported that French children use more words for food, clothes, etc., and less social interaction words than Japanese children do; Japanese children also develop a peculiar vocabulary of expressive words specific to Japanese language (e.g., 'kira-kira' denoting something shiny). Possibly, then, Japanese infants aged 10-12 months are more familiar with, for example, politeness and
expressive words. The familiar words we used were necessarily reflecting this specificity since they were largely drawn from infants’ early productions. However, given the limited number of items, clearly preferred words were perhaps under-represented. The weaker preference found in Japanese infants may also reflect a language-specific difficulty to build a lexicon. Indeed, there is a clear trend in Japanese for strongly polysyllabic word forms, and for widespread homonymy. Hence, lexical acquisition is, perhaps, more demanding in Japanese than in English or French. Further research is needed to clarify these issues.

5. REFERENCES


6. APPENDIX

List of the words used, given in phonemic transcription, and their approximate translation. Word accent is indicated by underlying the low pitch mora(s), other mora(s) having a high pitch.

Familiar words | Rare words
---|---
qi (foot) | hauwa (talks on "haiku")
aQin (here it is) | gQwai (crushing)
jiwai (it's not here) | esui (ace)
ba (car) | bouyo (a given place)
dao (hug) | tont (elimination)
nde (telephone) | daNage (assertion)
hai (it's got into it) | fiqi (adultery)
zyun (juice) | zyusi (resin)
ktu (shoes) | kigi (detrimant)
eNge (sleep) | nOkaiN (daily publication)
wNwax (doggy) | wase (made in Japan)
dons (please) | soNai (silk thread)
Sound File References:

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