

YOUNG INFANT'S PERCEPTION OF SEGMENTAL AND SUPRASEGMENTAL INFORMATION: PRELIMINARY RESULTS

Francisco Lacerda, Ulla Sundberg, Christin Andersson and Åsa Rex
Inst. of Linguistics, Stockholm University, S - 106 91 Stockholm, Sweden

ABSTRACT

This paper is a partial progress report from an experimental study addressing the question of whether "prosodic markers" help infants to discriminate between naturally presented word contrasts. The speech materials were carrier sentences in which target words are presented for discrimination. The prosodic characteristics of the carrier sentence were varied to enable comparisons between contrasts when the target word receives the main sentence stress and contrasts when the main stress is shifted to a non-changing word. The infants were randomly assigned to one of two groups — the infant-directed speech group or adult-directed speech group. At this point, 10 infants, with an average age of 8.5 months, were tested with the head-turn technique. The current results indicate that, contrary to what might be expected on the basis of infants' preference for motherese, adult-directed speech leads to better discrimination between the target words than infant-directed speech.

INTRODUCTION

Adults talking to young infants tend to use a type of speech generally referred to as motherese or infant-directed speech. This type of speech can be generally characterised as containing exaggerated features in relation to an adult-to-adult reference speech — higher F_0 , larger F_0 excursions and lower speech tempo than adult-directed speech [5]. Because infants attend preferentially to infant-directed speech [1, 3, 12], it is possible that the exaggerated prosodic features of

the motherese may also assist the infant in structuring the linguistic information of their ambient language. In addition it has been reported that young infants are sensitive to the correct placement of prosodic juncture markers [8]. Thus, if infants pay preferential attention to motherese that convey rather explicit prosodic information [4], if they can correctly use prosodic information to detect word boundaries, if they are capable of detecting virtually all phonetic contrasts that they have been tested with [6] and if they also are sensitive to the phonotactic patterns of their native language by 9 months of age [9], then infant-directed speech may assist the infant in extracting relevant linguistic information from its ambient language [2, 7].

To test this hypothesis we assessed the infants' capacity to discriminate target words embedded in carrier sentences. Our hypothesis was that the target words were presented in focal position in sentences produced as infant-directed speech should be easier to discriminate than when the same target words occurred in non-focal position or were presented in adult-directed speech sentences.

METHOD

Stimuli

The stimuli were two sets of natural sentences produced by an adult female native speaker of Swedish — one set produced as infant-directed speech and the other as adult-directed speech. The sentences can be described as a presentation sentence (a carrier sentence,

"Det är små _____ där", "There are small _____ there") in which the target word and/or the word in focus is changed. Table 1 shows how the sentences contrasted within one of the set of infant-directed speech.

The stimuli were produced by editing the target-words in the appropriate carrier sentences and calibrated with adult listeners.¹ The sentences were organised

consecutive correct responses the infants proceeded to the criterion phase, including both change and no-change (control) trials. In this phase the infants were also requested to generalise from the single contrast to two less clear contrasts. The infants had to produce 7 correct responses within 8 consecutive trials to proceed to the test phase in which only contrasts within a speech

Table 1. Reference and contrast sentences used in the experiments. The word in focus is underlined.

Reference sentence	Word contrasts	Prosodic and word contrasts
Det är små <u>myror</u> där	<u>minor</u> , <u>manar</u>	Det är... minor, manar, myror

in one set of infant-directed speech and another of adult-directed speech sentences.

Subjects

The present results were obtained from 10 infants living in monolingual Swedish language environments. The infants had an average age of 8.5 months, with a standard deviation of 0.6 months. The subjects were randomly assigned to the "infant-directed speech" group or the "adult-directed speech" group.

Procedure

The infants' ability to discriminate between the reference sentence and its variants was tested with the head-turn paradigm [10]. The test procedure consisted of three phases — conditioning, criterion and test phase. In the conditioning phase the infants were trained to produce head-turns in response to a large contrast between sentences involving differences in direction, focus and maximal change in the target word ("myror"/"manar"). All trials in this phase were change trials. After three

direction were used.

Discrimination measures

The discrimination metric used here is the unbiased d' measure. Because d' holds infinite values if the percentage of hits or false-alarms is either 0 or 100, these bottom and ceiling values were adjusted to 0.1 and to 99.9 before performing the d' computations. The d' scores were submitted to a one-way analysis of variance in which the d' obtained for each of the contrasts involving word change, with or without change in the sentence focus were treated as repeated measures. The factor was the intended direction of the speech — adult-directed vs. infant-directed.

RESULTS

The average scores obtained for the adult-directed and for the infant-directed speech are displayed in figure 1. Discrimination scores were poorer for infant-directed speech than for adult-directed speech in four of the five word contrasts. Only the *myror/minor* contrast in non-focal position had higher average scores for infant-directed speech than for adult-directed speech.

¹ The details of this procedure and results from the adult perception tests will be published elsewhere [11].

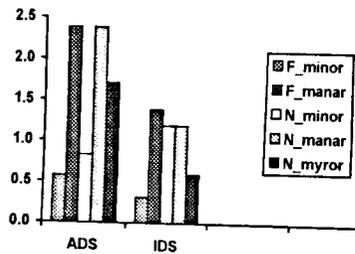


Figure 1. Average discrimination scores (d') for adult-directed speech and for infant-directed speech.

An analysis of variance in which the five discrimination scores from the word contrasts were modelled as repeated measures with direction of the speech as a factor, revealed no significant differences between the two types of speech ($F(1,8)=1.620$, $p < 0.239$). The within subjects' measures indicated a significant difference among the responses to the five word-contrasts ($F(4,32)=3.127$, $p < 0.028$). Since the "myror/minor" non-focal contrast did not match the pattern of the other four contrasts, an additional analysis of variance was performed in which this contrast was excluded. Also this analysis failed to reveal a significant difference between the adult-directed speech vs. infant-directed speech ($F(1,8)=2.938$, $p < 0.125$).

To assess specific differences in discrimination performance for each of the word contrasts involved, a series of Kruskal-Wallis analysis of variance was made. The results (two-tailed) reveal a strong tendency for a difference between adult- and infant-directed speech in the case of the single focus contrast, i.e. no change in the target word ("myror", focal vs. non-focal, $p < 0.054$). For the focal vs. non-focal contrast involving change of the target word, "myror" vs. "manar" the two-tailed probability was only $p < 0.199$.

The consequences of the change in the sentence focus were analysed by the

Wilcoxon's test. The results indicate only a tendency ($p < 0.08$) towards sensitivity to focus changes in the case of the "myror"/"minor" contrasts, produced with adult-directed speech.

DISCUSSION

In this paper we considered only our current data on infant sentence discrimination. The present results are based on a very small sample. Thus, given the variance in the responses of the subjects, it is wise to view these results only as a preliminary indication of possible response patterns.

Subjects' sensitivity to segmental and prosodic cues

The within-subjects' results indicate that the infants' performance varied significantly depending on the word contrasts that they were tested with. Within each group, discrimination of a target word without associated changes in focus seems to be dependent to the relative prominence of the segmental changes involved. The discrimination scores for "myror"/"minor" contrasts in focal position are lower than those for "myror"/"manar", as it might be expected on the basis of the phonetic differences involved. The contrasts involving displacement of the sentence focus produced large differences in the d' scores but there seems to be a complex interaction between focal displacement and magnitude of the word contrast. It could be expected, for instance, that the within-subjects' discrimination scores for a contrast involving only changes in the target word would be systematically lower than those involving both a lexical and a focus change. In fact this was only true for the contrasts between "myror" and "minor", in adult-directed speech. Thus, it seems that the contrast "myror"/"manar" was so salient by itself that the additional change in focus did not contribute significantly to further improvement in the discrimination scores.

Influence of the type of speech on the discrimination performance

The pattern of variation in the d' scores suggests a difference in the performance of the adult-directed speech group and the infant-directed speech group. However, the variance within each of the groups is too large to enable a statistically significant difference. Since previous research indicates differences in the infants' attention to infant-directed and adult-directed speech, it would not be surprising to find significant differences in this case too. However, because the present results were obtained from a very small sample there is high probability of type II error.

One important aspect emerging from the present results is that the possible significant difference between the adult-directed and the infant-directed types of speech does not occur in the expected direction. The discrimination scores are actually worse in the case of infant-directed speech than for adult-directed speech. If this pattern holds, it suggests that the infants' attention may be overloaded by a focus on paralinguistic aspects. Infants prefer to listen to the prosodically richer speech involved in infant-directed speech [4] but they seem to drop their attention to the segmental information it conveys.

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