

Consonant specification in infant-directed speech. Some preliminary results from a study of Voice Onset Time in speech to one-year-olds.

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Abstract

Voice Onset Time in voiceless and voiced stops in Swedish infant-directed speech (IDS) to 3-month-olds are significantly shorter than in adult-directed speech (ADS). It is hypothesized that such consonant under-specifications to young infants are changed to be over-specifications in IDS to 11-14 months old infants, according to a model of how segmental and suprasegmental phonetic aspects are changed as a function of the addressed infant's age. The reason for this change may be due to the mothers' intuitive accommodations of their communicative intentions related to their infants' development. Preliminary results confirm the hypothesis of over-specified VOT values in IDS to one-year-olds as compared to ADS.

1 Introduction

1.1 Backgrounds

Adults interacting with infants intuitively modify several prosodic aspects such as mean and range of fundamental frequency, according to cross-language investigations (e.g. Fernald, Taeschner, Dunn, Papousek, de Boysson-Bardie, Fukui, 1989). The mean f_0 is higher and the f_0 range is expanded in the infant-directed speech (IDS) in comparison to the adult-directed speech (ADS). At the segmental level vowels also seem to be over-specified in that duration is increased and vowel space is expanded in IDS (Kuhl, Andruski, Chistovich, Kozhevnikova, Ryskina, Stolyarova, Sundberg and Lacerda, 1997). (Over-specified in this context, means 'more of', 'longer' or 'enhanced'). Such prosodic modifications may be explained in terms of prominence and preference for the infant, i.e. the highly modulated intonation contours seem to be both salient and attractive to the infant. Since vowels are the main carriers of intonation it seems logic that these segments would undergo over-specified modifications similar to those affecting f_0 itself. But what about phonetic specifications of consonants in IDS? There are unfortunately few data on the phonetic content of consonants in IDS, but in a study of Voice Onset Time in Swedish IDS it turned out that three-month-old infants are exposed to significantly shorter VOT, both in voiced and voiceless stops, than was the adult listener (Sundberg and Lacerda, 1999). These results are discussed within a framework of a hypothesized differential weighting system of phonetic aspects such as prosodic, sonorant and obstruent. The specifications of these aspects are hypothesized to be changing as a function of the addressed infant's age, as is illustrated in Figure 1. The production of obstruent segments,

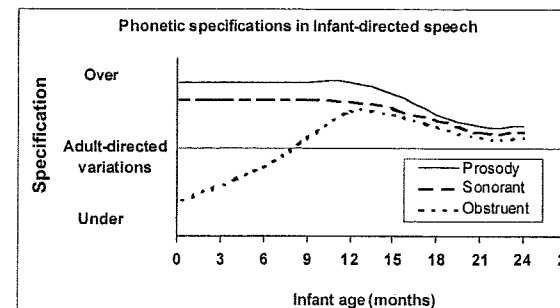


Figure 1. Selectively adapted phonetic specifications of prosodic, sonorant/vocalic and consonant/obstruent aspects in IDS. Amount of specification as a function of the addressed infant's age.

such as voiced and voiceless stops, are under-specified, in terms of shorter VOT values in IDS to three-month-olds, whereas they are hypothesized to be over-specified to 11-14 months old infants.

Why then, would mothers intuitively produce stops with longer VOT to these older infants? In the framework discussed above it is hypothesized that both suprasegmental and segmental aspects are accommodated to both the speaker's communicative intentions and as well as the demands required in terms of listener's level of comprehension, according to the H&H theory (Lindblom, 1990). In a typical setting with a 12-month-old infant, he or she is busy exploring the surrounding environment, walking unstably or crawling around and investigating or playing with various objects. The mother's role is often that of directing the infant's movements and actions and her speech needs to be clear enough to get through to the busy infant. But the main reason for hypothesizing longer VOT values to the older infants may be that parents seem to be aware of the developing speech capacity of their infant. Typically, the one-year-old infant produces his/her first words at this age and also, the word learning capacity may be dramatically increasing over the period 9 to 17 months. The mother's wish to direct the infant's actions and to teach him or her new words could be manifested in over-specification of those segments whose main phonological function is to signal distinctivity, i.e. consonants. One way of doing that could be, for example, by prolonging the VOT in their IDS. The hypothesis in the present study is thus that mothers intuitively over-specify obstruent specifications in terms of prolonging their VOT values in stop consonants in their IDS to 11-14 months old infants relative to their ADS.

2 Method

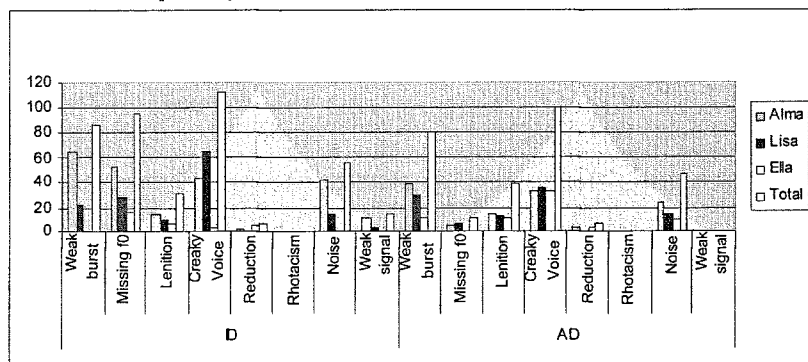
2.1 Data collection

Six Swedish mothers were recorded while interacting with their infants during 15-25 min. The IDS speech sample is collected during this session while the ADS speech sample is collected during the immediately following session when the mother and the experiment leader talked informally about the previous session and about the infant's daily routines and so on.

2.2 Data analyses

The recordings were stored as digitized audio files and transcribed orthographically. All words containing voiced or voiceless stops are subjected to analysis of the following variables: Syllable and word length, duration of occlusion phase and VOT i.e. the time gap between the onset of the explosion and the onset of voicing. All words containing voiced or voiceless stops are classified as semantic or grammatical morphemes and the syllable to which the stop belonged is determined to be lexically stressed or unstressed. A total number of 856 VOT values are obtained from 3 of the informants. A large number of stops are eliminated from analysis due to the following factors: Weak burst, missing f0, lenition (stop closure substituted by frication), creaky voice, reduction, rhotacism (occasionally [d] is substituted by a perceived [r], especially in grammatical morphemes), noise or weak signal (see Table 1).

Table 1. Number of voiced and voiceless stops where VOT is not measured and the reasons for these stops being discarded.

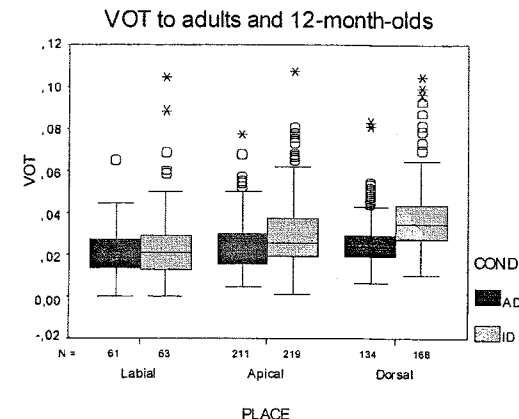


3 Some preliminary results

A preliminary analysis of variance (ANOVA) is performed on values pertaining from the voiceless stops and with three factors: speaking condition (IDS and ADS), place of articulation (labial, apical and dorsal) and mother (Alma, Lisa and Ella). The analysis shows very significant differences in the three factors (see Figure 2). The significantly longer VOT values in IDS relative to those in ADS support the hypothesis of over-specified VOT in IDS to infants aged 11-14 months. In the further analyses the variables mentioned above will be analyzed.

4 Discussion

The preliminary results are compatible with the hypothesis of over-specified VOT-values in IDS directed to one-year-old infants. This result stand in contrast to the under-specified VOT-values in speech directed to three-month-olds (Sundberg and Lacerda, 1999). Taken together these results lend support for the model of differential specification of consonant/obstruent aspects as a function of the addressed infant's age.



References

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