

## Prosodic boundaries in Hungarian infant-directed speech

Ádám Szalontai<sup>1</sup>, Katalin Mády<sup>1</sup>, Andrea Deme<sup>2</sup> and Anna Kohári<sup>1</sup>

<sup>1</sup>Hungarian Academy of Sciences; <sup>2</sup>Eötvös Loránd University

{szalontai.adam|mady.katalin|kohari.anna}@nytud.mta.hu; andrea.deme@btk.elte.hu

The goal of the present study is to investigate the differences between infant-directed speech (IDS) and adult-directed speech (ADS) in terms of prosodic boundary marking in Hungarian. Previous studies have considered three types of cues: the presence and duration of pauses, the duration of sound segments that may indicate pre-final lengthening (like the vowel in a phrase-final syllable), and pitch range (e.g. pitch reset after boundary) [2]. Ludusan et al.'s survey of previous research in the topic found that pause duration is almost always longer in IDS, while pre-final lengthening has usually been found to also be longer, but not always (e.g. [3], while data from pitch range showed inconclusive results. This study investigates the whether boundary cues are realised more clearly in IDS, and if their realisation is affected by the infants' age.

This study reports on data from the initial findings of a longitudinal study of IDS in Hungarian, comprising of the ADS and IDS of 22 mothers at two stages of their child's development: 4 and 8 months. Recordings were based on a fairytale created for the purposes of the study, which was told by the participants to an adult (the administrator of the experiment) and to their child at both 4 and 8 months. The fairytale contained sentences as uttered by characters in the story. These sentences contained the target word /la:tlak/ 'I see you' followed by a prosodic boundary. Three types of prosodic boundaries were used: word (W) level (1), accentual phrase (AP) level (2), and intonational phrase (IP) level (3). The recordings were manually segmented, the annotators were also asked to give ratings of "0" (unaccented), "1" (accented) and "2" (strongly accented) to words following the target word, since the presence of accents in Hungarian, a left edge/head prominent language [1], can indicate a preceding boundary. The parameters used in the analysis were the duration of the vowel /a/ in the final syllable of the target word normalised to the initial syllable of the target word /la:tlak/, the presence and duration of pauses, and the perceived accent prominences of the word following the target word. The statistical analysis of the data was carried out by linear and generalised linear mixed-effects models, with boundary type, register (ADS vs. IDS) and age of child (4 vs 8 months) as fixed effects and subjects as random effects.

Results are shown in Figure 1. There were no significant differences between registers, nonetheless, while ADS displays the expected tendency of having longer durations as boundary strength increases, IDS shows a different behavior: while there was a close-to-significant effect of boundary type ( $\chi^2 = 4.813, p = 0.09$ ) with significant differences between AP and IP boundaries ( $z = -2.5, p = 0.039$ ). This was likely caused by the (unexpected) shortening of duration before the AP boundary. The presence of pauses after the target word correlated with the boundary strength: 0% for W, 12% for AP and 31% of IP. There was no significant difference between registers. In terms of pause duration, there was also no effect of register, the age of the child or boundary type (AP vs IP). The distributions of prominence ratings are shown in 2. According to the  $\chi^2$  test, there was a significant effect of boundary type ( $\chi^2 = 93.1, p < 0.0001$ ) in terms of perceiving a "1" or a "2" as opposed to a "0", with AP and IP boundaries being more likely to be followed by accented or strongly accented words. It was also found that speakers use more strong accents after AP ( $z = -2.102, p = 0.035$ ) and IP ( $z = -2.102, p = 0.035$ ) boundaries in IDS than in ADS. The results of the experiment confirm a smaller difference between IDS and ADS than observed elsewhere in the literature, but they fall in line with research conducted with children of similar ages [3]. These results will be compared to IDS at a higher age of the infants in the course of the longitudinal study.

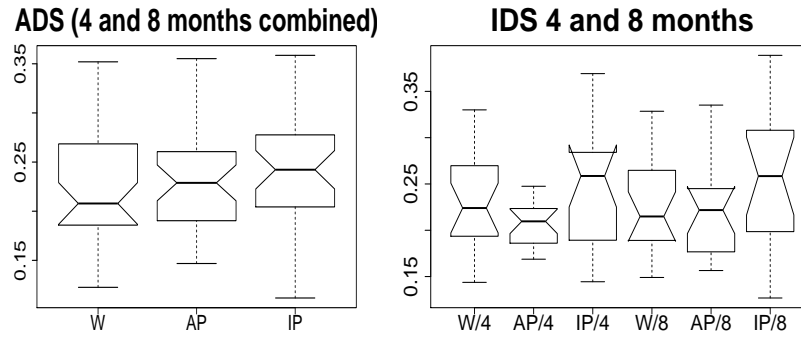


Figure 1: Relative duration of phrase final vowel in CVC for ADS and IDS, for word final (W), accentual phrase (AP) final and intonational phrase (IP) final positions at 4 and 8 months of the child’s age.

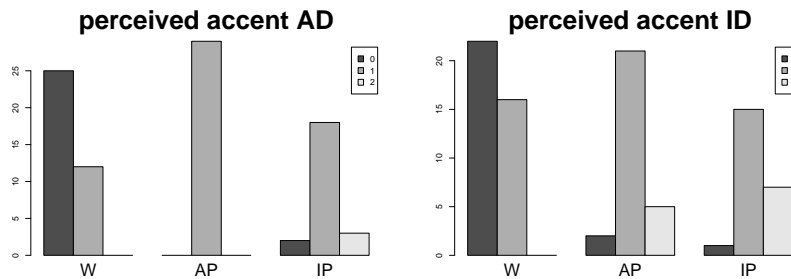


Figure 2: Perceived prominences assigned to the word following boundary in ADS and IDS, combining data from 4 and 8 months. Dark = Unaccented, Grey = Accented, Light = “Strongly Accented”.

- (1) Látlak | ám a málnásban.  
see.1sg disc.particle the raspberry.in  
‘I see you in the raspberry grove!’
- (2) Látlak | odalent a tóparton.  
see.1sg down there the lake shore.on  
‘I see you down there by lake shore!’
- (3) Látlak, | ott vagy a barlangban.  
see.1sg there be.2sg the cave.in  
‘I see you, there you are in the cave!’

## References

- [1] Sun-Ah Jun. Prosodic typology: By prominence type, word prosody, and macro-rhythm. In *Prosodic Typology II: The new development in the phonology of intonation and phrasing*, pages 520–539. University Press, Oxford, 2014.
- [2] Bogdan. Ludusan, Alejandrina Cristia, Andrew Martin, Reiko Mazuka, and Emmanuel Dupoux. Learnability of prosodic boundaries: Is infant-directed speech easier? *J. Acoust. Soc. Am.*, 140(2):1239–1250, 2016.
- [3] Yuanyuan Wang, Amanda Seidl, and Alejandrina Cristia. Acoustic-phonetic differences between infant- and adult-directed speech: The role of stress and utterance position. *Journal of child language*, 42:1–22, 2014.

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