

When prosody matters: Emerging word segmentation abilities in European Portuguese learning infants

Joseph Butler, Cátia Severino, Marina Vigário & Sónia Frota

Center of Linguistics, University of Lisbon, Portugal

drjoebutler@gmail.com, catiaseverino@gmail.com, marina.vigario@mail.telepac.pt,
sonia.frota@mail.telepac.pt

Early word segmentation plays a crucial role in language acquisition (i.e., in the development of the lexicon and morphosyntax – Swingley, 2009). Previous studies have shown variability in the development of segmentation abilities across language and across utterance contexts (e.g., Jusczy et al., 1999; Nazzi et al., 2006, 2014; Polka & Sundara, 2012; Bosch et al., 2013; Johnson et al., 2014). It has been suggested that the rhythmic properties of a language (i.e., stress based and syllable based rhythm) may be utilised to begin segmenting continuous speech. Recently, the role of word position was also considered, with words appearing at utterance boundaries easier to segment than those in the middle since those at the edge provide particularly salient cues. This paper is the first attempt to study emerging segmentation abilities in European-Portuguese (EP) learning infants. EP is a language that displays both stress and syllable timed properties, unlike English, French, or Spanish (Frota & Vigário, 2001). Also unlike other languages, EP prosody provides strong cues to intonational phrase boundaries (pitch accent, boundary tone and duration cues), but not to lower phrase boundaries and words (Vigário, 2003; Frota, 2014). The aims are to investigate whether prosody constrains early word segmentation abilities in EP and to identify at what point in development segmentation abilities emerge, in comparison with other languages.

EP learning infants' ability to segment monosyllabic word forms at three ages (6, 9 and 12 months) was tested. At 6 and 9 months, infants' segmentation abilities for word forms at the final Intonational Phrase (IP) boundary (the sentence edge) and internally within the IP were compared. Twelve month olds were tested for segmentation at IP boundaries internal to the sentence, without the pause cue, as well as at Prosodic Word (PW) boundaries within the IP. Segmentation abilities were assessed by familiarising infants with utterances containing pseudo word forms either within or at the IP boundary, and segmentation was demonstrated by longer looking times to isolated familiar word forms compared with novel word forms. At 6 months, infants only segment at the final IP boundary, but not internally to the IP (mean looking times edge – 7.06ms, internal – 4.51ms, novel – 4.09ms). Nine month olds show evidence of development in segmentation abilities. In addition to segmenting at the boundary, they are better at segmenting at the internal boundary, which collapsed a PW edge with a lower phrase boundary (mean looking times edge – 7.75ms, internal 6.05ms, novel - 4.79ms; Fig.1). At 12 months, infants segment at internal IP boundaries (mean looking times internal IP – 6.37ms, novel – 4.72ms), demonstrating similar behaviour, segmentation wise, to 6 month olds at final IP boundaries; however, they were unable to successfully segment at PW boundaries within the IP (mean looking times internal word boundary - 7.10ms, novel 6.27), similarly to segmentation behaviour at 9 months within the IP (Fig. 2).

These results show that segmentation abilities in EP learning infants emerge around 6 months of age but only at final IP edges (as for English, but unlike in Spanish and Catalan which show segmentation regardless of word position), and further development is evident throughout the first year. In addition, these results show that prosody constrains early word segmentation,

which builds upon, and goes further than the edge vs internal sentence hypothesis (Johnson et al., 2014). These findings add to our existing knowledge of the emergence of segmentation abilities, and of what cues constrain, or are utilised, during the development of this ability, across languages.

Selected References

- Bosch, L., Figueras, M., Teixidó, M. & Ramon-Casas, M. (2013). Rapid gains in segmenting fluent speech when words match the rhythmic unit: Evidence from infants acquiring syllable-timed languages. *Frontiers in Psychology*, 4, 106.
- Frota, S. (2014). The intonational phonology of European Portuguese. In Sun-Ah Jun (ed.) *Prosodic Typology II*. Oxford: Oxford University Press, pp. 6-42.
- Johnson, E.K., Seidl, A. & Tyler, M.D. (2014). The edge factor in early word segmentation: Utterance-level prosody enables word form extraction by 6-month-olds. *PLoS ONE*, 9(1):e83546.
- Jusczyk, P.W., Houston, D.M. & Newsome, M. (1999). The beginnings of word segmentation in English-learning infants. *Cognitive Psychology*, 39, 159-207.
- Nazzi, T., Iakimova, G., Bertoncini, J., Frédonie, S. & Alcantara, C. (2006). Early segmentation of fluent speech by infants acquiring French: Emerging evidence for crosslinguistic differences. *Journal of Memory and Language*, 54, 283-299.
- Nazzi, T., Mersad, K., Sundara, M., Iakimova, G. & Polka, L. (2014). Early word segmentation in infants acquiring Parisian French: task-dependent and dialect-specific aspects. *Journal of Child Language*, 41(3), 600-633.
- Polka, L. & Sundara, M. (2012). Word segmentation in monolingual infants acquiring Canadian English and Canadian French: Native language, cross-dialect and cross-language comparisons. *Infancy*, 17(2), 198-232.

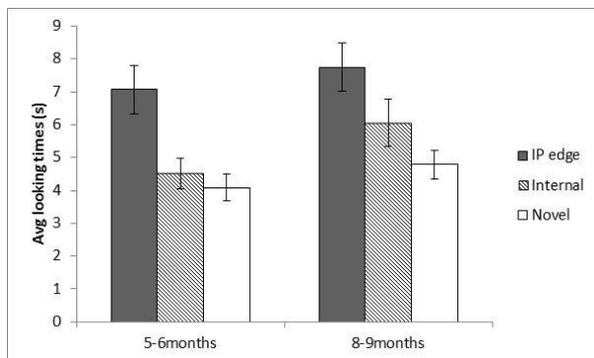


Figure 1: Average looking times (s) to word forms at the IP edge, internally (lower phrase and PW edges), and novel word forms at 5-6 and 8-9 months (N=20 per age group)

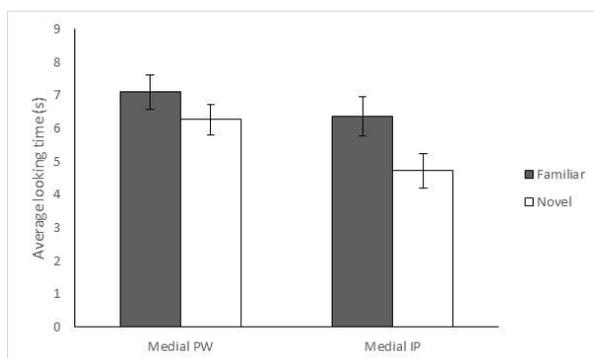


Figure 2: Average looking times (s) to familiar and novel word forms for medial PW and medial IP edges, by 12 month olds (N=20 per condition).