Predicting children's narrative structure: The value of non-referential beat gestures and their concomitant prosodic prominence in spontaneous interactions

Ingrid Vilà-Giménez[1,2], Natalie Dowling[3], Ö. Ece Demir-Lira[4,5,6], Pilar Prieto[7,1], & Susan Goldin-Meadow[8,3]

[1]Dept. of Translation and Language Sciences, Universitat Pompeu Fabra, Barcelona, Catalonia; [2]Dept. of Subject-Specific Education, Universitat de Girona, Girona, Catalonia; [3]Dept. of Comparative Human Development, University of Chicago, Illinois, USA; [4]Dept. of Psychological and Brain Sciences, University of Iowa, USA; [5]DeLTA Center; [6]Iowa Neuroscience Institute; [7]Institució Catalana de Recerca i Estudis Avançats (ICREA), Barcelona, Catalonia; [8]Dept. of Psychology, University of Chicago, Illinois, USA

ingrid.vila@udg.edu, ndowling@uchicago.edu, ece-demirlira@uiowa.edu, pilar.prieto@upf.edu, sgm@uchicago.edu

Oral language skills play an important role in subsequent successful school literacy. Given the fact that early gestures not only precede, but also predict simple linguistic milestones (e.g., Iverson & Goldin-Meadow, 2005), it is important to ask whether the early production of gestures could also signal oncoming changes in more elaborated discourses including more complex language skills. While recent studies have shown the predictive role of referential gestures (i.e., iconic character-viewpoint gestures) produced in narratives in children's ability to perform well-structured stories (Demir, Levine, & Goldin-Meadow, 2015), to our knowledge, no previous study has addressed the predictive role of spontaneous non-referential gestures (i.e., beat and flip gestures) in children's narrative productions in later stages of development. Our hypothesis on the predictive value of beat gestures (vs. flip and iconic gestures) is based on evidence that suggests that (1) non-referential beat gestures associate with key positions in discourse which are typically associated with speech prominence, and that (2) they have a range of pragmatic and structuring properties in discourse (e.g., Shattuck-Hufnagel, Ren, Mathew, Yuen, & Demuth, 2016).

The current study investigates the predictive role of early spontaneous non-referential beat and flip gestures in children's later narrative performance (i.e., narrative structure), in comparison to referential iconic gestures. To examine whether the early production of non-referential beats and flips at 14 to 58 months of age (vs. referential iconics) predicts later narrative structure at 60 months (5 years old), a stepwise regression analysis was undertaken with a longitudinal database including 45 child-parent dyads who were visited every four months between 14 and 58 months of age. Each in-home visit consisted of 90 minutes of parent-child naturalistic interactions. Recordings included mealtimes, book readings, as well as play sessions. This longitudinal database is part of a larger longitudinal study of language development at the University of Chicago. A narrative production task was administered at 60 months (data from Demir, Fisher, Goldin-Meadow, & Levine, 2014).

Results revealed that early spontaneous non-referential beats were significant predictors (p = .018) of later narrative performance, but not non-referential flips (p = .180) nor referential iconic gestures (p = .924). This study thus shows for the first time that children's early frequency of use of non-referential beat gestures in parent-child naturalistic spontaneous interactions between 14 and 58 months of age forecasts their narrative abilities (in terms of narrative structure scores) at a later stage in development. Importantly, these findings are in line with previous research that has demonstrated the pragmatic, discursive and prosodic properties of non-referential beat gestures. In this sense, non-referential beat gestures not only act as meaningful prosodic pragmatic cues that mark certain aspects of the structure of the discourse (i.e., information structure, discourse structure and rhythm) (e.g., Im & Baumann, 2020; Prieto,

Cravotta, Kushch, Rohrer, & Vilà-Giménez, 2018; Rohrer, Vilà-Giménez, Florit-Pons, Esteve-Gibert, Ren, Shattuck-Hufnagel, & Prieto, 2020; Shattuck-Hufnagel et al., 2016), but can also show the illocutionary act that a speaker is engaged in, and indicate how a specific part of the spoken discourse should be interpreted (Kendon, 2017).

All in all, although our findings did not tell us whether producing non-referential beat gestures simply *reflects* a child's skill in framing discourse or highlighting aspects of prosodic focus (e.g., emphasis), we argue that the pragmatic role and structuring function that non-referential beats play in emerging discourse patterns may be key for children's early discourse and later narrative development. These findings constitute a novel contribution to the literature which highlights the relevance of non-referential beat gesture production for children's narrative development.

Keywords: non-referential beat gestures; parent-child interactions; narrative abilities.

REFERENCES

DEMIR, Ö. E., FISHER, J. A., GOLDIN-MEADOW, S., & LEVINE, S. C. (2014). Narrative processing in typically developing children and children with early unilateral brain injury: Seeing gesture matters. *Developmental Psychology*, *50*(3), 815–828.

DEMIR, Ö. E., LEVINE, S. C., & GOLDIN-MEADOW, S. (2015). A tale of two hands: children's early gesture use in narrative production predicts later narrative structure in speech. *Journal of Child Language*, *42*(3), 662–681.

IM, S., & BAUMANN, S. (2020). Probabilistic relation between cospeech gestures, pitch accents and information status. *Proceedings of the Linguistic Society of America*, *5*(1), 685– 697.

IVERSON, J. M., & GOLDIN-MEADOW, S. (2005). Gesture paves the way for language development. *Psychological Science*, *16*(5), 368–371.

KENDON, A. (2017). Pragmatic functions of gestures. Some observations on the history of their study and their nature. *Gesture*, *16*(2), 157–175.

PRIETO, P., CRAVOTTA, A., KUSHCH, O., ROHRER, P., & VILÀ- GIMÉNEZ, I. (2018). Deconstructing beat gestures: a labelling proposal. In K. Klessa, J. Bachan, A. Wagner, M. Karpiński, & D. Śledziński (Eds.), *Proceedings of the 9th International Conference on Speech Prosody* (pp. 201–205). Poznań, Poland.

ROHRER, P. L., VILÀ-GIMÉNEZ, I., FLORIT-PONS, J., ESTEVE-GIBERT, N., REN, A., SHATTUCK-HUFNAGEL, S., & PRIETO, P. (2020). The MultiModal MultiDimensional (M3D) labelling scheme for the annotation of audiovisual corpora. *Proceedings of the 7th Gesture and Speech in Interaction (GESPIN)*. KTH Speech, Music & Hearing and Språkbanken Tal. Stockholm, Sweden.

SHATTUCK-HUFNAGEL, S., REN, A., MATHEW, M., YUEN, I., & DEMUTH, K. (2016). Non-referential gestures in adult and child speech: Are they prosodic? In J. Barnes, A. Brugos, S. Shattuck-Hufnagel, & N. Veilleux (Eds.), *Speech Prosody 2016* (pp. 836–839). Boston, United States of America. International Speech Communication Association.