Prediction during Language Processing is a Piece of Cake – but only for Skilled Producers

Nivedita Mani[1] and Falk Huettig[2]

1. Language Acquisition Junior Research Group, University of Göttingen, Germany, nmani@gwdg.de
2. Max-Planck Institute for Psycholinguistics, Nijmegen, The Netherlands, falk.huettig@mpi.nl

Keywords: Prediction; Production Vocabulary; Language-mediated Visual Search; Toddlers.

Background

Adults orient towards an image of a cake upon hearing sentences such as "The boy will eat the cake" even before hearing the word *cake*, i.e., soon after they hear the verb EAT (Kamide et al., 2003). This finding has been taken to suggest that verb processing includes prediction of nouns that qualify as arguments for these verbs. Upon hearing the verb EAT, adults and young children (three- to ten-year-olds; Borovsky et al., in press) anticipate upcoming linguistic input in keeping with this verb's selectional restrictions and use this to orient towards images of thematically appropriate arguments.

Research Questions

Against this background we ask two questions. First, we ask whether *two-year-olds* similarly anticipate nouns that are in keeping with a verb's semantic selectional restrictions (i.e., anticipate edible nouns upon hearing EAT) and use this to orient towards images of thematically appropriate nouns. Second and more importantly, we ask whether toddlers' skill in predicting upcoming linguistic input is correlated with their language production skills (Chang et al., 2006; Pickering & Garrod, 2007).

Method

Two-year-olds were presented with images of two objects, e.g., a cake and a bird, and heard sentences containing either semantically constraining verbs such as "The boy eats the big cake" or sentences containing semantically non-constraining verbs such as "The boy sees the big cake". We then examined children's eye-movements towards the target image, i.e., cake, following the onset of the verb but prior to the onset of the target label.

Results

Children oriented towards the image of the target image, i.e., cake, even before they heard the corresponding noun, but only in the context of semantically constraining verbs (eat) but not following semantically non-constraining verbs (see). Furthermore, we found that children's production skills, i.e., their production vocabulary size significantly correlated with their prediction skills – children with larger production vocabularies were better at anticipating upcoming linguistic input to orient towards thematically appropriate arguments. This correlation remained significant even when any influence of children's comprehension vocabulary size was residualised from the influence of their production vocabulary size on prediction.

Discussion

With regard to the two questions posed by this research, we show first that even two-year-olds are able to use information extracted from the verb to predict lexical items that are semantically more suited to acting as the arguments of these verbs. Second, our data support an important role for production-based mechanisms in language comprehension (Chang et al., 2006; Pickering & Garrod, 2007). Importantly, this finding suggests that there is a component to children's prediction ability that is specifically tied to their production skills and not to their comprehension skills (as suggested by the correlation with residualised production scores). This might be taken to suggest that prediction using production is not a general feature of language comprehension but may be more specific to the learning of production representations (cf. Chang et al., 2006).

References

Borovsky, A., Fernald, A., & Elman, J. (in press). Knowing a lot for one's age: Vocabulary skill and not age is associated with anticipatory incremental sentence interpretation in children and adults. *Journal of Experimental Child Psychology*.

Chang, F., Dell, G. S., & Bock, K. (2006). Becoming syntactic. *Psychological Review*, 113, 2, 234-272.

Kamide, Y., Altmann, G.T.M., & Haywood, S.L. (2003). Prediction and thematic information in incremental sentence processing: Evidence from anticipatory eye movements. *Journal of Memory and Language*, 49, 133-156.

Pickering, M. J., & Garrod, S. (2007). Do people use language production to make predictions during comprehension? *Trends in Cognitive Sciences*, 11, 105-110.