

## OP2.07. Multimodal predictors of early object noun recognition in Tsel'tal

Online presentation

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What are the key predictors of word learning in Tsel'tal? Tsel'tal (Mayan) early language environments have been described as both non-child-centered and non-object-centered (Brown, 2011, 2014). Directly-addressed speech from adults makes up a minority of Tsel'tal learners' available language input (Casillas et al., 2017). And while Tsel'tal children frequently handle objects (Casey et al., 2022), object labeling by adults is rare (Brown, 2011, 2014). Thus, opportunities for direct mapping of noun labels onto handled objects are sparse. These observations lead to a theoretical puzzle, given that mainstream accounts from middle-class Western contexts posit that object labeling and handling are key predictors of early word learning (e.g., Braginsky et al., 2019; Muraki et al., 2022; Suarez-Rivera et al., 2022). We ask: do these multimodal factors similarly influence Tsel'tal children's lexical development? If so, Tsel'tal data would support the utility of these input features across diverse learning contexts. If not, we would need to rethink what drives Tsel'tal children's early word learning (e.g., a larger influence of overheard and observed input).

Method: 62 children up to age 4 (mean=2;07.02, range=0;09.09-3;11.24) participated in a word-recognition experiment (30 object nouns; Looking-while-Listening (LWL, Fernald et al., 2008)). Adult object labeling and child object handling frequencies—estimated from daylong photo-linked audio recordings (Casillas et al., 2017) from 43 children in the same community/age range (31 overlapping with LWL sample)—were used as predictors of LWL performance. Labeling frequency was counted in 45 randomly-sampled minutes per recording (target-child-directed language only), and object handling frequency was counted in each full daylong photo stream (~2 photos/minute). Raw frequency counts were centered and scaled to test for item-level variation in looking behavior based on relative, aggregate input statistics across our dataset.

Results (Accuracy): A linear mixed-effects regression with by-child and by-word random intercepts revealed that children's overall, salience-corrected accuracy in looking to labeled target objects was above chance ( $\beta=0.19$ ,  $SE=0.02$ ,  $p<0.001$ ), with positive comprehension scores for 28/30 object nouns and significant improvements over age ( $\beta=0.06$ ,  $SE=0.02$ ,  $p<0.001$ ). Labeling and handling frequency did not significantly impact overall LWL accuracy ( $ps>0.05$ ).

Results (Timecourse): A growth-curve analysis (Mirman, 2014) revealed mixed evidence for effects of labeling and handling frequency on the dynamics of children's looking behavior. We found positive two-way interactions only between the cubic time term and labeling ( $\beta=0.07$ ,  $SE=0.02$ ,  $p<0.001$ ) and handling ( $\beta=0.06$ ,  $SE=0.02$ ,  $p=0.004$ ) frequency. We also found significant three-way interactions between both frequency predictors and the linear and cubic time terms ( $ps<0.01$ ), suggesting an advantage in online word recognition for the most frequently labeled and handled objects. Age also negatively interacted with labeling ( $\beta=-0.04$ ,

SE=0.005,  $p < 0.001$ ) but not handling ( $\beta = -0.02$ , SE=0.004,  $p < 0.001$ ) frequency, indicating stronger effects of this predictor for younger children.

Discussion: Tseltal children under age 4 showed reliable recognition of object nouns (see also Foushee & Srinivasan, under review). Adult object labeling and child object handling frequency did not affect overall word-recognition accuracy, but preliminary evidence suggests that, at the group level, children were faster to recognize objects that were among the most frequently labeled and handled. Our results indicate that, in addition to object handling experiences, Tseltal children's online word recognition may be influenced by labeling frequency in directly-addressed speech, but current findings leave open the strong possibility that Tseltal children's early word learning is also, or better, predicted by their experiences with overhearable language.