Developmental parsing across SES: Trade-offs between cue reliability and input quantity

Yi Ting Huang, Kathleen Oppenheimer, & Zoe Ovans (University of Maryland College Park)

Across socioeconomic status (SES), distinctions in parental input lead to variation in early language (Hart & Risley, 1995), but underlying mechanisms are not well understood. A barrier to progress is the reliance of aggregated measures of input (e.g., total words) and outcomes (e.g., vocabulary size). These track the accumulated consequences of learning, but ignore how children acquire new words and abstract grammatical biases through iterative encounters with sentences. Among higher-SES groups, it is well known that children recruit multiple cues to interpret sentences. By age five, they exploit word order to assign subjects as agents (e.g., "*The seal is*…"→ predict an up-coming patient like FISH (Huang et al., 2013)), verb semantics to anticipate related objects (e.g., "*It is eating the*…" → food like FISH (Borovsky et al., 2012)), and verb syntax to infer specific roles (e.g., "…*eaten by the seal*" → patient like FISH (Snedeker & Trueswell, 2004). Unlike word order, verb biases provide detailed and reliable clues about who did what to whom (e.g., *p*(PATIENT|"*eat*")). However, abstracting probabilistic biases requires specialized input during development (e.g., "*eat*" sentences). This, in turn, may require additional experience. Trade-offs between input quantity and cue reliability (agent-first vs. verb bias) raise questions of what comprehension is like when input varies with SES background.

We examined comprehension of actives and passives in 129 children from varying SES, ages 3;6 to 7;2. While parental input was not directly measured, its effects on aggregated knowledge were assessed through vocabulary size (Dunn & Dunn, 2007). This metric is sensitive to experience effects on comprehension, and SES differences in this sample ($p<.001$). Sentences featured two types of NP1s: (1) Definite NP1s (e.g., "*The seal*…") vs. (2) Pronoun NP1s (e.g., "*It*…"). Eye-movements/actions were measured to an expressed item (e.g., SEAL), likely agent (e.g., SHARK), and likely theme (e.g., FISH). Previous research reveals that children from higher-SES backgrounds interpret definite NP1s with an agent-first bias, but often fail to revise misinterpretations after passive morphology (e.g., "…*eaten by it*"). However, they avoid an agent-first bias for pronoun NP1s, and accurately interpret actives and passives alike. Importantly, effects of vocabulary size on comprehension may shed light on how children revise an agent-first bias (i.e., definite NP1/passives) and how they interpret sentences when this bias is absent (i.e., pronoun NP1/actives, passives). If these contexts require access to verb-specific biases, then the accuracy of role assignment may increase with experience-related vocabulary size. Conversely, if the agent-first bias can be readily abstracted from canonical word order, then role assignment on this basis (i.e., definite NP1/actives) may not vary with vocabulary size.

Fixation analyses focused on definite NP1s and predictions of pronoun referents after verb morphology. Children fixated on correct referents more for actives compared to passives ($p<.01$), but this difference was smaller for those with larger vocabulary (vocabulary x construction, $p<.05$). Action analyses examined act-out responses after sentences. For definite NP1s, all children produced more accurate actions for actives compared to passives ($p<.01$). However, those with larger vocabulary revised passives to a greater extent (vocabulary x construction, $p<.05$). For pronoun NP1s, children produced similar accuracy across constructions ($p>.30$), which improved with vocabulary size (vocabulary, $p<.01$). Taken together, these findings suggest that developmental parsing is influenced by procedures across two time scales. During online comprehension, children predict meanings via early-arriving cues within sentences but have difficulty revising after late-arriving conflicts. During year-to-year development, children abstract cue-to-meaning relations via distributional regularities across sentences. While some cues require minimal input to abstract (agent-first bias), others require more (verb biases). Importantly, comprehending passives offers a window into interactions between chronometric and ontogenetic procedures. Greater knowledge of verb-specific biases enables effective revision agent-first biases (e.g., hear "*eat*," retrieve transitive bias, infer passive structure). We will discuss the implications of these findings for theories of language acquisition.