INTERPRETING SILENT GESTURE

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Silent gesture, a lab methodology in which adult hearing participants describe simple events using only their hands, has proven to be a valuable window into the origins of word order (the ordering of Subject, Object and Verb) in language. Recent experiments using this methodology have uncovered word order biases in silent gesture *production*. People prefer SOV order when they describe extensional transitive events (*boy-pale-swing*, (Goldin-Meadow, So, Özyürek, & Mylander, 2008)), but prefer SVO order for events with different semantic properties, such as intensional events: *man-think of-ball, witch-build-house* (Schouwstra & de Swart, 2014). However, a core underexplored question (but see, e.g., Hall et al., 2015) is whether these biases also feature in silent gesture *interpretation*: when people interpret silent gesture strings, will they behave similarly to when they produce them? In this presentation, we describe experimental and computational analyses of silent gesture interpretation: first, in a silent gesture experiment we examine interpretation of the semantically conditioned word order variation found in the production experiments of Schouwstra and de Swart (2014); second, we develop a Bayesian computational model of silent gesture interpretation, and fit the model to our experimental data.

In our experiment, we recorded silent gestures of ambiguous actions (e.g., a gesture that could mean *build* as well as *climb*). For each ambiguous action, we composed ambiguous gesture strings describing transitive events: one in SVO and one in SOV order (e.g., witch-climb/build-house and witch-house-climb/build). We predicted that participants would be more likely to interpret SVO ordered videos as intensional events than as extensional events, and vice versa. Forty one Dutch and forty Turkish participants watched twelve videos (6 in SVO and 6 in SOV order; we used two different versions to make sure that all participants saw each video in only one order), and were asked, after each video, to choose an interpretation from two line drawings of the two target events (one intensional and one extensional). We found that for SOV sequences, an extensional interpretation was given significantly more often (M=.711, SE=.019) than for SVO (M=.569, SE=.020), and the native language of the participants did not influence this.

Participants used word order as a key to the semantic distinction between intensional and extensional events: their word order preferences are semantically conditioned, as in silent gesture production. However, a key aspect of our findings is that this effect is weaker in interpretation than in production. What does this tell us about word order biases? We develop a compuational model of the experimental task, based on the idea that silent gesture interpretation can be understood as inductive inference under uncertainty. Modelling interpretation as Bayesian inference allows us to explicilty specify the influence of word order preferences – or *prior beliefs* – on judgements about the unseen intentions of another gesturer. Our model assumes participants account rationally for the uncertainty that surrounds the gesturer's usage of word order in the absence of labelled examples – consistent with the idea that the learner is entertaining emerging linguistic rules. By fitting the model to participants' interpretations, we infer a quantitative estimate of their underlying inductive biases, which suggests skewed and asymmetric – but crucially defeasible – event class conditional ordering preferences. The biased model (M1), but not an unbiased alternative (M0), predicts the experimental data well. Furthermore, despite their weakened effect on interpretation, the biases we infer align well with results from production experiments, suggesting silent gesture interpretation is underpinned by computational principles that balance word order biases with communicative uncertainty. Only by understanding the interplay of biases in production and interpretation, and the computational principles that govern these processes during learning and communication, can we begin to understand the emergence of word order regularities in human language.

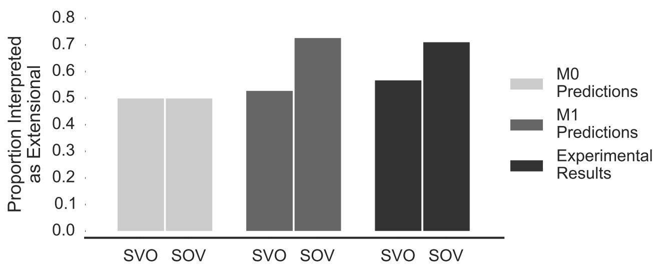

Figure 1. Experimental results (right), alongside predictions of the unbiased (M0, left) and biased (M1, middle) models. Bars show proportion of gestures interpreted as Extensional events.

References

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