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## FROM NATURAL ORDER TO CONVENTION IN SILENT GESTURE

MARIEKE SCHOUWSTRA, KENNY SMITH, SIMON KIRBY

*Centre for Language Evolution, School of Philosophy, Psychology & Language Sciences,  
University of Edinburgh, Edinburgh, United Kingdom*

*Marieke.Schouwstra@ed.ac.uk, kenny@ling.ed.ac.uk, simon@ling.ed.ac.uk*

Silent gesture, an experimental paradigm in which adult hearing participants describe events using only their hands, has been valuable for investigating the origins of word order. Goldin-Meadow et al. (2008) found a language-independent preference for SOV for extensional transitive events (e.g., boy-ball-throw), but participants prefer SVO for intensional events (e.g., boy-search-ball; Schouwstra & de Swart, 2014).

The SVO/SOV pattern for intensional/extensional events arises independently of participants' native language, and, we will claim, represents naturalness, reflecting cognitive preferences to put Agents first (Jackendoff, 2002) and more abstract/relational information last. However, existing languages tend not to condition word order on event type and are instead more regular. Understanding this transition from naturalness to conventionalised regularity is a major goal of language evolution research. We present a new approach to this challenge using a novel experimental paradigm in which silent gesture is both used for communication (Christensen et al, 2016) and culturally transmitted through artificial generations of lab participants (Smith et al, in prep). This allows us to investigate how individual humans improvise solutions to communicative challenges, how pairs of individuals create conventions through interaction, and how these conventions are transmitted over time through learning.

In experiments 1a and 1b, 48 participants were assigned into dyads. Stimuli were 64 line drawings of intensional and extensional events. Participants alternated between the role of actor and interpreter, in six rounds of 32 trials. As actor they described an image using only their hands, and as interpreter they selected (from an array of 8) the image they thought was intended by the actor. Experiment 1a showed intensional and extensional events equally often; in experiment 1b, extensional events were more frequent (75%) than intensional events (25%).

The word orders showed signs of conventionalisation: over the rounds, word order became less conditioned on meaning. 7 of 12 dyads in experiment 1a con-



Figure 1 An example of an extensional event, 'artist drops hammer' (left) and an intensional event, 'nun dreams of violin' (right).

verged on a single word order:<sup>a</sup> all of them SVO (the dominant order of English, the native language of all participants). In experiment 1b, 3 dyads converged on SVO word order, and 3 other dyads on SOV. The dyads who failed to converge used a mix of SOV and SVO orders.

Experiments 2a and 2b were carried out with 16 groups of 8 participants (8 groups per condition) in a gradual turnover design. In round one, participants 1 and 2 were communicators, and 3 was an observer. Each consecutive round, one of the communicators left, the observer became a communicator, and a new participant became observer. Experiment 2a used equal amounts of extensional and intensional stimuli, and experiment 2b had more extensional (75%) than intensional (25%) events. In Experiment 2a, 5 out of 8 groups converged on SVO word order, while in Experiment 2b, 3 groups converged on SVO and 2 groups converged on SOV. This shows that even in a turnover setup, where participants interact for a maximum of two rounds instead of six, convergence of word order is possible, and dependent on the frequency of event types.

Our experiments show that in silent gesture communication and transmission, semantically conditioned word order tends to disappear in favour of regular word order. The frequency of event types determines how regularisation progresses. This suggests that where pressures for naturalness and regularity are in conflict, languages start natural, but naturalness will give way to regularity as signalling becomes conventionalised through repeated usage.

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<sup>a</sup>For each dyad we counted the proportion of the most frequent word order in the last 2 rounds, and those in which this was  $\geq .8$  were counted as converging.

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