**From single words to full sentences**

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Sentence formulation unfolds incrementally: people normally begin speaking having encoded some, but not all, of the information they need to produce a full sentence before speech onset. However, the type of information that controls the timecourse of encoding is a matter of debate (Gleitman et al., 2007, vs. Griffin & Bock, 2000). For example, on one account (radical incrementality), speakers may begin formulation by encoding only the first character in an event with priority (e.g., *The fireman...*) and then add information about the second character (...*saving the boy*) after speech onset. On another account (broad-scope planning), formulation may begin instead with speakers encoding information about the event as a whole, which involves encoding information about the action (*saving*). Radical incrementality predicts that formulation should be controlled by the ease of encoding individual characters (i.e., information expressed with *nouns*) while broad-scope planning predicts that the ease of encoding relational information (i.e., information expressed with *verbs*) should also influence formulation.

Here we use a correlational approach to distinguish between these accounts. We test whether production speed and the timecourse of formulation for full sentences can be predicted by speakers' retrieval speed for *nouns* and *verbs*. A stronger influence of noun retrieval speed on sentence formulation would support radically incremental accounts of formulation, while a stronger influence of verb retrieval speed would support broad-scope planning.

22 eye-tracked native speakers of Dutch performed three production tasks in one session. In the first task, they described a series of unrelated pictures, including 33 pictures of transitive, two-character events. In the second and third task, they named 138 object and 103 action pictures, respectively (task order was counterbalanced). These tasks included object and action pictures that elicited the modal nouns and verbs used to refer to the characters and to the actions shown in target events in the event description task, intermixed among filler pictures. The object and action pictures were not visually similar to the target events. Analyses tested whether naming latencies for target nouns and verbs predicted sentence onset latencies as well as eye movements during production of active sentences in the event description task.

Hierarchical multiple regression analyses showed that action naming speed ($\beta$ = .53, $p$ = .03) but not object naming speed ($\beta$ = .08, $p$ = .73) predicted sentence onsets (the $R^2$ of the full model [.32] dropped reliably when action naming was removed [$R^2$ change = .21, $F$ = 5.78], but not when object naming was removed from the model [$R^2$ change = .00, $F$ = .12]). Effects of action and object naming speed on the timecourse of formulation were assessed with by-participant quasi-logistic regressions performed over agent-directed fixations (Barr, 2008). Action and object naming did not predict the distribution of fixations in an early, 0-400 ms time window (compared to a simple model including only Time as a fixed effect). Fixations to the agent increased between 400 ms and 1000 ms, and then decreased between 1000 and 1800 ms (approx. speech onset) as speakers began shifting their gaze to the patient. Importantly, shifts of gaze away from the agent were predicted by action naming latencies (producing an Action naming speed x Time interaction), but not object naming latencies.

The results of both analyses suggest that sentence onset latencies as well as the timecourse of formulation are influenced more strongly by processes responsible for encoding relational information than information about individual characters. This supports production accounts of broad-scope planning at the outset of formulation.

References:

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