Syntax guides sentence planning: evidence from multiple dependency constructions
Shota Momma (UMass, Amherst) & Masaya Yoshida (Northwestern U.)

In production, it has been suggested that speakers plan verbs before starting to speak their patient (or theme) arguments but not their agent arguments (Momma & Ferreira, 2019 a.o.). However, it is unclear *why* speakers plan verbs selectively before the production of patient arguments. One possibility is that speakers plan verbs before their patient arguments because the (conceptual correlate of) patient role but not the agent role critically depends on verb meaning (Kratzer, 2002) (*the conceptual account*). An alternative possibility is that speakers plan verbs before their patient arguments because they are directly selected by verbs as their complement (*the syntactic account*). To evaluate these two accounts, here we examine the timing of verb planning in the production of sentences involving *Across-The-Board* (ATB) and *Parasitic Gap* (PG) constructions (Table 1). ATB and PG are very similar. Most relevantly, the conceptual dependency between fillers and verbs are identical in the example sentences; in both ATB and PG, the initial filler (*which article*) is the theme/patient of the event denoted by the second verb (*criticize*). In contrast, under some theories (Chomsky, 1982 a.o.), the filler is directly selected by the second verb only in ATB, because the syntactic object of the second verb in PG is a null pronoun (or operator) coreferential with the filler. That is, the filler is directly selected by the second verb in ATB (so the second gap is obligatory) but not in PG (so the second gap can be replaced with an overt pronoun). Therefore, the conceptual account predicts that the second verb is planned before the filler in both ATB and PG. Meanwhile, because the filler is directly selected by the verbs only in ATB, the syntactic account predicts that it is planned before the filler in ATB but not in PG. We tested these predictions in two experiments.

In both experiments, we used a new variant of sentence recall task, where participants read a sentence in the RSVP fashion, read aloud 2-4 random verbs, and recalled a sentence as soon as they saw a distractor verb in red font (Fig. 1). Our working assumption is that sentence recall involves the *regeneration* of sentences from conceptual memory (Potter & Lombardi, 1990), and thus it involves the usual processes of grammatical encoding. The distractor words, which also served as a recall prompt (indicated by the font color), were sometimes semantically related to the second verb of the target sentences (e.g., *recommend* for the target *criticize*). Related distractors were used as unrelated distractors in other trials, so the set of related and unrelated distractors were identical. By examining where speakers slow down in their utterances due to the interference from related distractors, we can make an inference about when speakers plan verbs. **Exp. 1** (n = 47) ensured that this new task works and that the distractors we chose specifically interfere with the second verb in ATB and PG. Speakers recalled 64 sentences like in Table 2, where the critical verb is the verb that will be used as either the first or the second verb in ATB and PG in Exp. 2. Only correctly recalled sentences were analyzed. Speakers were slower to start utterances given the related distractor, but only in sentences with verbs that were used as the second verb in Exp. 2. This result establishes that speakers indeed plan verbs before the filler in this particular task context and that distractors are effective at eliciting the semantic interference effect specifically on the verb that will be used as the second verb in the ATB and PG sentences. **Exp. 2** (n = 155) tested the main predictions. Example target sentences, created by reusing filler NPs and verb-distractor pairs as in Exp. 1, are shown in Table 1. Given related distractors, speakers were slower to start speaking the filler in ATB but not PG (interaction *p* = .01), suggesting that speakers plan the second verb before sentence onset in ATB but not in PG. In comparison, speakers were slower to say the pre-second verb word in PG but not in ATB given related distractor (interaction *p* = .03), suggesting that speakers plan the second verb right before they say it in PG, but before utterance onset in ATB.

These results suggest that speakers plan verbs before the filler in ATB but just-in-time in PG (note that this does not suggest that all words between the filler and the gap are planned in ATB, because planning is likely not sequential. Momma et al. 2019). This timing contrast supports the syntactic account. More broadly, the results suggest that sentence planning is guided by the syntactic dependency (between verbs and their object) that is not reducible to a conceptual dependency (between verbs and their patients).

Table 1: Example ATB and PG sentences (these are also stimuli used in Experiment 2)

Sentence type	Target sentence
ATB	Which article did you read and criticize?
PG	Which article did you read before criticizing?

Table 2: Example stimuli used in Experiment 1. *First* and *Second* refer to the relative position of the verbs in the ATB and PG sentences used in Experiment 2.

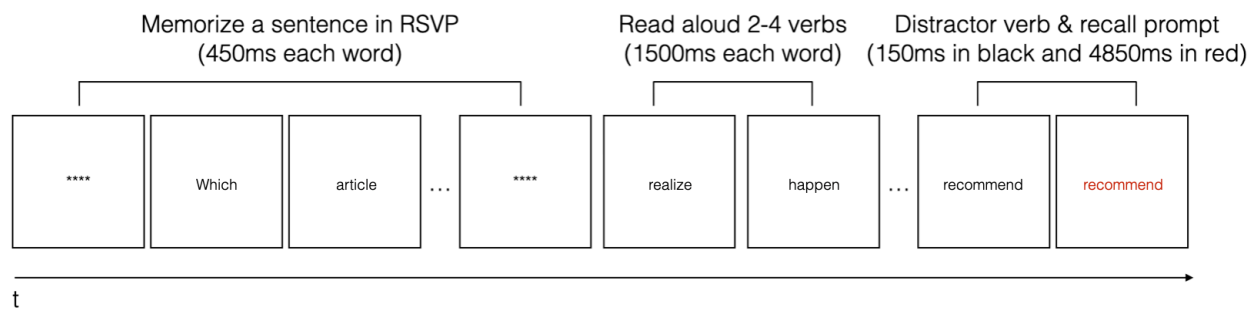| Verb position	Target sentence
First verb	Which article did you read?
Second verb	Which article did you criticize?

Fig. 1: A schematic illustration of the experimental task. Note that the number of random verbs to be read aloud between the memorization and the recall was variable across trials. To prevent speakers from predicting when they were to recall sentences. Note also that the distractor verb was initially in black; it turned red 150ms after the onset of the presentation. This is to increase the chance that speakers register the distractors.
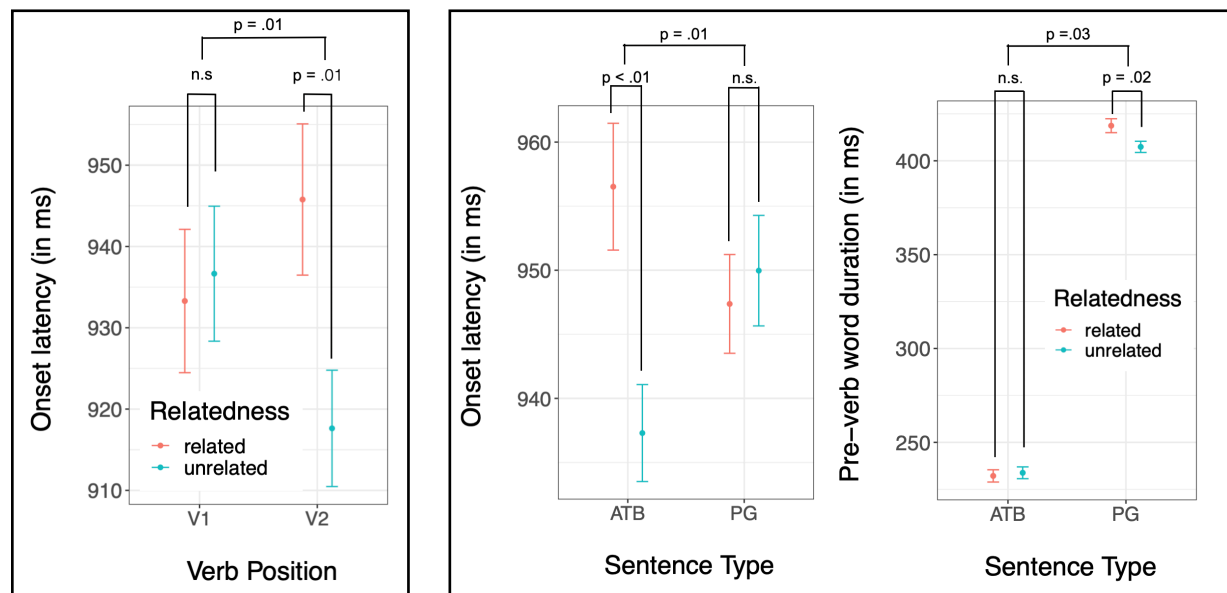

Fig. 2 (left): Results of Experiment 1. Fig. 3 (right): Results of Experiment 2 (onset latency and pre-second verb word duration).