Is the octopus regenerating?: Comparing timing effects in sentence recall and picture description tasks

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Do sentence recall and picture description tap into the same production mechanisms? Prior work supports the possibility that sentence recall can elicit and measure some phenomena found in "normal" (non-recall) sentence production, including phenomena observed via picture description tasks [4,1]. Potter and Lombardi's *regeneration hypothesis* [4] proposes that sentence recall involves regenerating the sentence from its meaning, in a manner akin to "normal" production; if true, the increased flexibility in sentence complexity and structure offered by sentence recall tasks can greatly expand the options for studying speech production. However, the possibility remains open that sentence recall and picture description might differ in some regards, such as the granularity of the measurements they pick up on or even details of the production mechanisms they engage. Recently, Momma & Yoshida (2023) [3] (M&Y), using a variation of a sentence recall task called sentence-word interference (SWI), reported verb planning timing effects in English previously only shown in picture description experiments, such as [2] (Momma & Ferreira; M&F). M&F used a series of extended picture-word interference (ePWI) experiments in English to demonstrate a selective utterance onset delay due to semantically related distractor verbs. While sentences with unaccusative verbs (patient-like or underlyingly VP-internal subjects) exhibited an utterance onset delay, those with unergative verbs (agentive or underlyingly VP-external subjects) did not. M&F interpret this as evidence of a difference in planning strategies for varying argument structures that are superficially similar: sentences with unaccusative verbs involve an early commitment to the verb, whereas those with unergative verbs do not. M&Y ([3]) find a similar pattern of slow-down effects with semantically related distractor verbs in their sentence recall task, examining verb timing in sentences with complex filler-gap dependencies.

In the current work (N_{subj}=50, N_{item}=12, N_{trial}=48), we aimed to compare the SWI and ePWI methodologies by combining M&Y's SWI task with the English sentences from M&F's ePWI study (Table1). **We show that SWI measures fail to replicate the ePWI findings.** Our experiment featured a repeated measures design with four conditions (2x2): (i) verb type (*unaccusative* x *unergative*) and (ii) semantic relatedness between the distractor and the verb (*related* x *unrelated*). As in M&Y, participants were asked to read aloud a sentence followed by 2-4 random verbs in RSVP fashion, before a distractor verb shown in red font prompted them to recall the sentence that they had just read. Our **RESULTS** showed that neither verb type nor semantic relatedness had an effect on utterance onset latency (Fig2A) or pre-verb production time (Fig2B), contra M&F [2]. Our Bayesian GLMs fitted to correctly recalled sentences showed moderate evidence for a positive main effect of Unergativity in the preverb production time (θ=.02; CI=[-.02;.06]; $P(\theta>0)$=.90) but no interaction with relatedness (θ=-.01; CI=[-.07;.06]; $P(\theta>0)$=.42), meaning that unlike M&F's findings, participants slowed down when they were recalling unergative sentences in general (Fig3B), independent of distractor relatedness. We also verified a lack of evidence for either main effects or interaction for the onset latency measure (Fig3A). The lack of evidence for an interaction in onset latency (θ=-.02; CI=[-.12;.08]; $P(\theta<0)$=.64) means that participants did not slow down before uttering the sentence as a function of semantic relatedness in unaccusative sentences, failing to demonstrate a signature finding for verb planning effects [e.g. 2].

By directly comparing ePWI with SWI, we were able to demonstrate that the two methodologies reveal diverging effects. There are a number of possible explanations for these results, three of which may be (1) that these tasks engage distinct psycholinguistic processes (potentially calling into question the regeneration hypothesis), (2) that these tasks have different measurement sensitivities, such that one task can pick up on finer effects than another, or (3) that specific properties of the stimuli make SWI appear more or less similar to ePWI. In any

case, our findings raise questions about how generally sentence recall can be used to interrogate timing effects in production.

Figures: Data preprocessed and visualized using MFA [5], R and the *tidyverse* packages, and analyzed with the packages *brms* and *cmdstanr* to fit maximal Bayesian GLMs [6]. Error bars in Fig2 show mean and 95% CrIs [7]. Posterior distribution plots (Fig3) show the mode of the distributions and 95% HDIs in log scale. Red coefficients (Fig3) suggest a slowdown. $P(\theta>0)$ is our degree of evidence for a slowdown ($P(\theta<0)$ for a facilitation/faster production.)
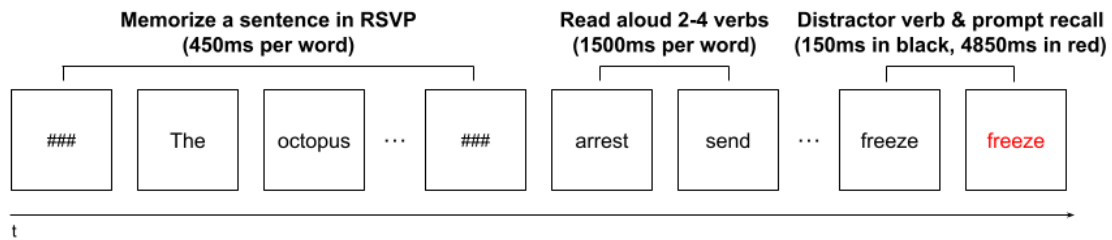

Fig1. A schematic illustration of the sentence recall task

Table1. Items used in the experiment. The experiment was conducted in PCIbex [5].

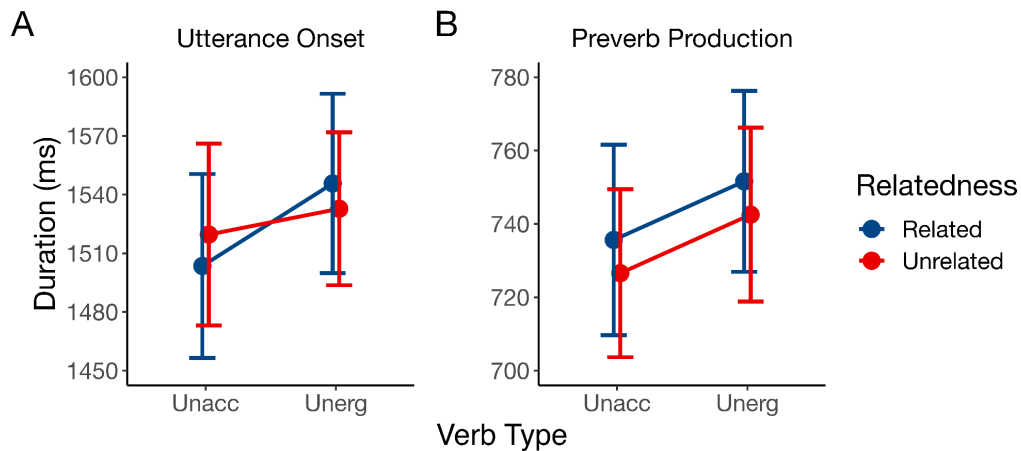| Condition	Target Sentence	Related	Unrelated
Patient-like (unacc)	The octopus below the spoon is boiling.	melt	fall
Agentive (unerg)	The octopus below the lemon is swimming.	run	smile

Fig2. **A:** <u>Onset Latency</u> from the last distractor offset to the first NP onset in the recalled sentence. **B:** <u>Pre-verb</u> Production Time from the second NP onset to the auxiliary *is* onset.
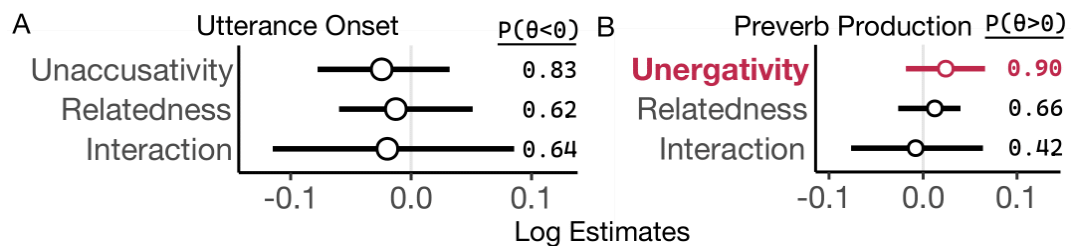

Fig3. **A:** Estimates and 95% CrIs for the regression coefs for the model of <u>Onset Latency</u> **B:** Estimates and 95% CrIs for the regression coefs for the model of <u>Pre-verb</u> Production Time

References: [1] Chang et al. 2003 *Cognition* **[2]** Momma & Ferreira 2019 *Cog Psych* **[3]** Momma & Yoshida 2023 *LCN* **[4]** Potter & Lombardi 1998 *JML* **[5]** McAuliffe et al. 2017 *ISCA* **[6]** Gelman & Hill 2007 **[7]** Morey 2008 *TQMP*