How do *repeated result states* fare in sentence comprehension and production?

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Prediction mechanisms used in comprehension have been claimed to resemble or overlap those involved in production (e.g. [2], [6]). To explore this in the domain of event structure, we test how discourse level information and verbs' lexical semantics guide expectations/predictions in comprehension (Exp.1) and production (Exp.2). Specifically, we investigate the processing and production of result states after change-of-state events (e.g. *hitting, breaking*). Crucially, these events can be described with verbs that do or do not semantically encode result states. This allows us to compare production/comprehension of result states that are either already lexically encoded in the preceding verb (i.e. *repeated result states*) or pragmatically inferred.

Background: Lexical semanticists (e.g. [7]) have identified two verb classes based on what the lexical meaning of the verb encodes: **result verbs** (e.g. *break*, *shatter*) encode the result state of an action; **manner verbs** (e.g. *hit*, *strike)* encode the manner, but not the result, of the action.

Questions: (i) How do verb type and discourse context guide expectations about an upcoming result state during *comprehension*? (ii) Do we observe similar effects in *production*?

Exp. 1 (N=40, self-paced reading) manipulated (i) context type (result-supporting vs. *neutral*) and (ii) verb type (mannerV vs. *resultV*) (2×2, Table 1). The result-supporting context focuses on the 'fate'/result state of the object, unlike the neutral context. Nonce nouns were used to avoid noun semantics influencing the plausibility of result attainment. All targets contain a result phrase (e.g. *damaged*). How do context and verb type influence how quickly the result phrase is read?

Results (Fig. 1): The **result phrase** (e.g. *damage*d) was read faster after resultV (*lmer*, t=2.71). There was also a significant interaction (t=2.05): in result-supporting contexts, RTs for result phrases in the mannerV and resultV condition do not differ (t=0.19). In neutral contexts, RTs for result phrases in the mannerV condition are longer than in the resultV condition (t=3.14).

Discussion: Lexical (verb class) and discourse-level information both guide comprehenders' expectations for an upcoming result phrase, thereby facilitating processing. To probe whether this expectation pattern is shared with the *production* system, we conducted Exp. 2.

Exp. 2 (N=40) investigates the role of lexical (verb type) and discourse level information in mentioning result in the upcoming discourse. We adapted the stimuli from Exp.1, truncating them before the result phrase (Table 2). Participants wrote completions for these clause fragments. The continuations were analyzed for (i) whether or not they describe a result and (ii) if so, what kind (ex. in Table 3): *Direct result* describes an immediate result state that follows directly from the action. *Indirect result* describes an indirect consequence/event that follows the result state.

Results: Overall, people produce more result-related continuations after resultV than after mannerV (|t|=3.93), regardless of context (no context effect, no interaction, Fig.2). However, when we look more closely at the subtypes of result-related continuations (Fig 3), the proportion of *direct results* is higher in the mannerV conditions (|t|=2.03). There is no context effect and no interaction.

Discussion: Mentioning a direct result is *less* preferred after a resultV than after a mannerV. Studies investigating the establishment of co-reference with repeated names have often found processing costs on the repeated noun—the *repeated name penalty* (e.g. [3], [5]), which has been attributed to general pragmatic principles (e.g. [1]). Our results are in line with this general idea that unnecessary repetition is dispreferred due to pragmatic principles.

Overall, we find that both the comprehension and production systems have a stronger preference for a result-related linguistic expression after encountering a resultV than a mannerV. Our study provides new insights on the processing and production mechanisms related to repetition: we find no processing costs related to repeating a result state in comprehension, but in production, repeating a result state entailed by the verb is less preferred. We conclude that although comprehension and production may be closely related, some biases (e.g. dispreference against repetition) are reflected more in production than in comprehension because production often involves deciding between options and can trigger more engagement (see e.g., [4]).

Table 1: Sample Target Item for Exp. 1 (34 targets, 48 fillers)

Trevor called and asked Mary what happened to$_{res.supp.Context}$/*about$_{neutralContext}$* the merick.
She replied that she hit$_{mannerV}$/*broke$_{resultV}$* it in the morning on Monday.
She said that it is damaged$_{result-phrase}$ and that she feels very sorry about this.

Table 2: Sample Target Item for Exp. 2 (24 targets, 24 fillers)

Trevor called and asked Mary { what happened to / *about* } the merick.
She replied that she { hit / *broke* } it in the morning on Monday.
She said that it is …

Table 3: Examples of Types of Continuations from Experiment 2

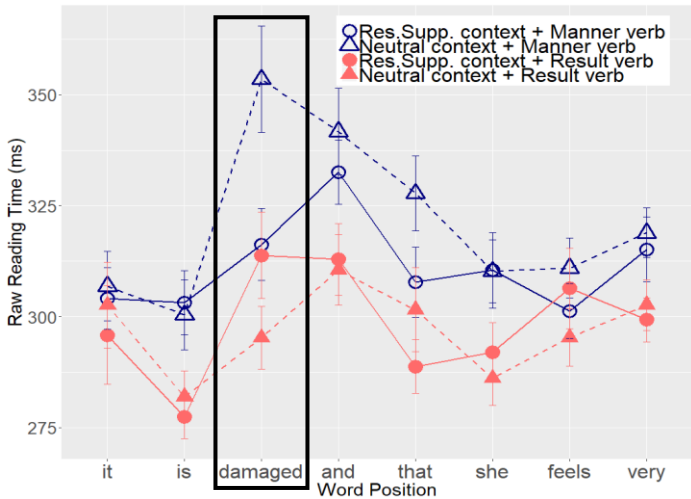| Jim called and asked Jessica [what happened to/about] the crail. She answered that she jabbed it at noon on Wednesday. She also said that it is …	
Direct result	*full of holes now.*
Intermediate result	*leaking a little bit.*
Indirect result	*going to be replaced later this afternoon.*
Non-result	*a bit rusty and probably was about to cave in anyway.*

Figure 1: Reading Times at the Result Phrase Region
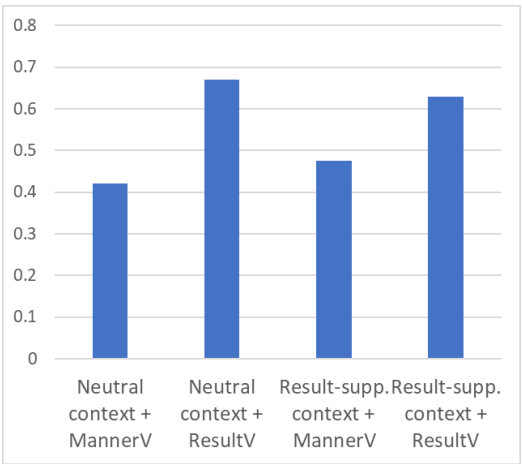

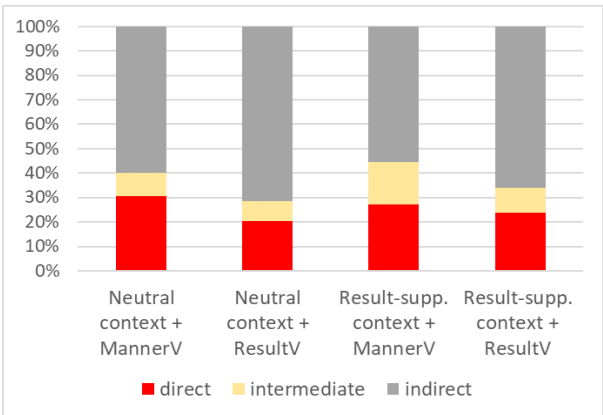**Figure 2**: Proportion of Result-related Continuations

Figure 3: What kind of result?

References: [1] Almor '99. Noun-phrase anaphora and focus: The informational load hypothesis. Psych. Rev. **[2]** Dell & Chang '14. The P-chain: Relating sentence production and its disorders to comprehension and acquisition. *Phil. Trans. R. Soc. B.* **[3]** Gordon, Grosz & Gilliom '93. Pronouns, names, and the centering of attention in discourse. *Cog Sci.* **[4]** Hintz & Meyer '15. Prediction and production of simple mathematical equations: Evidence from visual world eye-tracking. *PloS one.* **[5]** Ledoux, Gordon, Camblin & Swaab '07. Coreference and lexical repetition: Mechanisms of discourse integration. *Mem & Cog.* **[6]** Pickering & Garrod '13. An integrated theory of language production and comprehension. Behavioral and Brain Sciences. **[7]** Rappaport Hovav & Levin '98. Building Verb Meanings.