Plausible Plausibility: Replicating the Plausibility Mismatch Effect

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Much of what we know about the rapid application of grammatical knowledge, such as real-time use of verb subcategorization biases [6,7] comes from the study of how comprehenders process filler-gap dependencies (FGDs). FGDs create a long-distance relationship between two elements, the filler (e.g., *book* in (1)) and the gap (indicated by underscore). Previous work suggests that once comprehenders have identified a filler they actively search to determine the gap [1]. A prominent paradigm for tracing this 'active dependency' formation is the plausibility mismatch paradigm [2]. In this paradigm, reading times increase at the verb (*wrote* in (1)) when the filler is a semantically implausible theme (*city*) compared to a semantically plausible theme (*book*). The observed effect suggests that comprehenders form an early commitment to a particular semantic interpretation of an FGD and they do so without violating syntactic constraints [3,4].

However, the plausibility mismatch effect could be attributed to other factors. For example, reading times at *wrote* in (1) may be faster given that the filler is *book* because of the lexical association between these words, and not because comprehenders had resolved the FGD with a direct object interpretation. Here, we conduct a controlled replication of one widely cited plausibility mismatch effect study [2]. We ensured that likely influencing factors of reading times were controlled between conditions, which is not typically done in previous studies using this paradigm, including semantic association between filler and verb and lexical frequency of the filler. As in the original study, we also include sentences containing relative clause islands to test for the mismatch in islands, where comprehenders should not posit a gap.

EXPERIMENT (N=48). Using the Maze Task, we investigate whether the plausibility mismatch effect is replicated in the non-island condition and not in the island condition with controlled stimuli (Table 1). Maze-task is a forced-choice approach that avoids spillover effects as it requires incremental integration of each word as the participant builds the sentence. The current study is a 2 (PHRASE TYPE: Non-Island, Island) x 2 (PLAUSIBILITY: Implausible, Plausible) design, where the filler was a im/plausible patient to the critical verb's event. Distractor words were generated through A-Maze [5] then hand-corrected to ensure there was only one possible continuation. Participants were told when their choice was incorrect and could not continue until choosing correctly.

RESULTS. Reading times to correct the answer were first residualized on length and log-transformed, and then analyzed with a mixed-effects model. We directly compared their reading times at the main verb (*cook* in (2)), which were regions 5 and 6 for non-island and island conditions, respectively. There were main effects of PHRASE TYPE (β = -0.06, p < 0.001), suggesting that comprehenders read faster in the Island condition, and a main effect of PLAUSIBILITY (β = -0.04, p < 0.001) with results suggesting shorter reading times for the Plausible condition. We also observed a marginal interaction (β = 0.05, p = 0.06) that seemed to be driven by slower reading times in the Non-Island+Implausible condition. An unexpected effect was a later plausibility mismatch in the island conditions for the main verb (*recommend*).

DISCUSSION. After controlling for lexical frequency, semantic relatedness, and cloze probability, we replicated the plausibility mismatch. Participants read the verb slower in the non-island condition with the implausible filler, *ovens*, as opposed to the plausible filler, *recipes*. This is in line with the hypothesis that comprehenders are actively considering dependency resolution at the verb for both plausible and implausible fillers. The marginal interaction of phrase type and plausibility gives qualified support for previous claims [2] that plausibility mismatch effects are not observed inside islands; our study may be underpowered to detect this interaction. This study confirms that the plausibility mismatch effect is representative of a true mismatch in plausibility, not another factor. Future work plans to further explore the effect observed at the main verb (*recommend*) in the island condition.

Plausible	We like the *book* that the author **wrote** unceasingly and with great dedication about __.
Implausible	We like the *city* that the author **wrote** unceasingly and with great dedication about __.

Example 1. Stimuli from Traxler & Pickering (1996)

Non-Island Plausible	Which *recipes* do celebrity chefs **cook** enthusiastically for the serious judges?
Non-Island Implausible	Which *ovens* do celebrity chefs **cook** enthusiastically with during the competition?
Island Plausible	Which *recipes* do celebrity chefs who **cook** enthusiastically recommend to the audience?
Island Implausible	Which *ovens* do celebrity chefs who **cook** enthusiastically recommend to the audience?

Example 2. Stimuli from current experiment. Contained 32 experimental items and 64 fillers.

Semantic Association with Verb		Cloze Probability		Lexical Frequency	
Plausible	Implausible	Plausible	Implausible	Plausible	Implausible
0.359	0.323	0.097	0.041	-4.55	-5.10

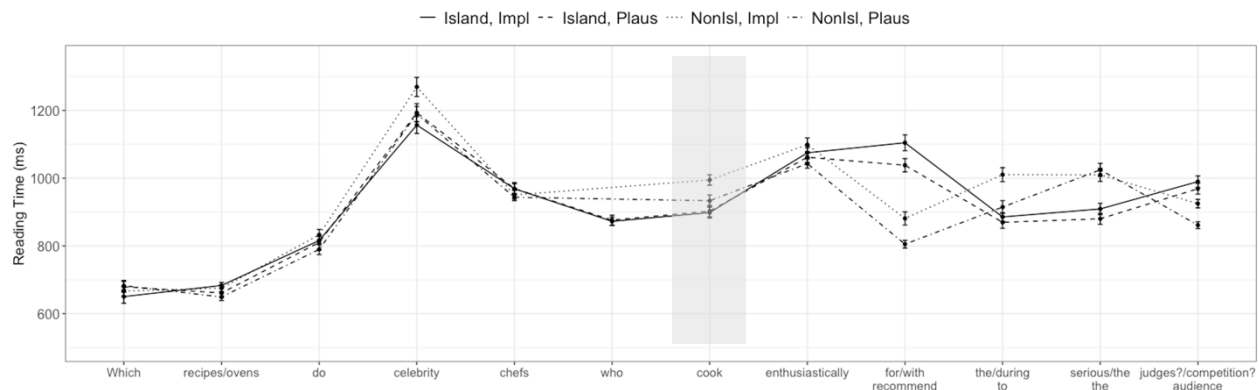**Table 1.** Summary of averages for the controlled factors for 32 experimental stimuli.

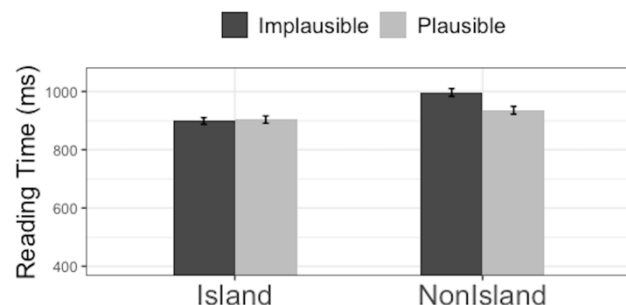**Figure 1.** Average reading times for each region.

Figure 2. Average reading times for the region of interest (*cook*) across conditions.

References: [1] Frazier & Flores d'Arcais, 1989. [2] Traxler & Pickering, 1996 [3] Phillips, 2006. [4] Wagers & Phillips 2009 [5] Boyce, Futrell, Levy, 2020. [6] Omaki, Lau, White, Dakan, Aaron, Phillips, 2015. [7] Pickering & Traxler, 2003.