RAPID SEMANTIC UPDATING DESPITE PREDICTION ERRORS: EYE-TRACKING EVIDENCE FROM MANDARIN CHINESE

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Comprehenders can predict upcoming language based on global context [1-2] and use disconfirming evidence or informative cues to update their predictions rapidly [3-5]. However, a recent study found that prediction failure hinders local semantic processing [6]. To further examine possible costs induced by prediction errors, we built on the design of [3] to use an unexpected nominal classifier to signal a prediction error and manipulated the adjective that follows. Our results suggest that listeners can use an informative cue to update their prediction even when it immediately follows an early sign of prediction error.

Participants (n=50) listened to Mandarin Chinese sentences while viewing four candidate objects on the screen (Fig. 1). The sentential context strongly predicted a particular noun (e.g., *shù*-tree) but always ended with an unexpected target noun (e.g., *zhuōzi*-table). We manipulated nominal classifiers (specific vs. general) and adjectives (informative vs. uninformative) preceding the target noun. The **specific classifier** was compatible with the target and competitor (e.g., *yǐzi*-chair) but incompatible with the initially-expected noun, serving as an indicator of prediction errors. The **informative adjective** uniquely matched the target noun, enabling prediction updating. The general classifier and the uninformative adjective were compatible with all the candidate nouns.

We observed that, after encountering a specific (relative to a general) classifier, listeners were more likely to look toward the unexpected target. As the sentence continued, they increased looks to the unexpected target upon hearing an informative (relative to an uninformative) adjective no matter whether it follows a specific or a general classifier (Fig. 2). The generalised additive mixed model showed a significant main effect of classifier ($p < .001$) and adjective ($p < .001$) but no interaction ($p = 0.86$). We then did a bootstrapping analysis [7] to directly compare the onset of divergence following a specific vs. general classifier (Fig. 3). The difference in the divergence points was only 15 ms (95% CI = [-80, 120]), suggesting that listeners were equally quick to use the informative adjective to update their noun prediction no matter whether they had just encountered a prediction error or not.

In conclusion, the present study reveals no measurable costs of prediction errors on subsequent semantic processing.

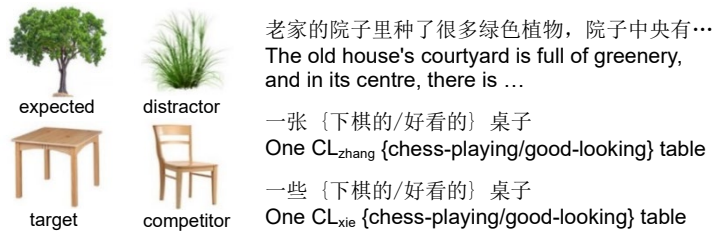

Figure 1. Sample material and visual display

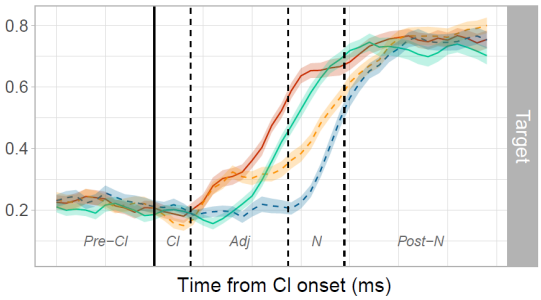

Figure 2. Proportions of looks to unexpected target, time-locked to the classifier onset (0 ms), across four conditions. Standard errors were shown in semi-transparent shades.

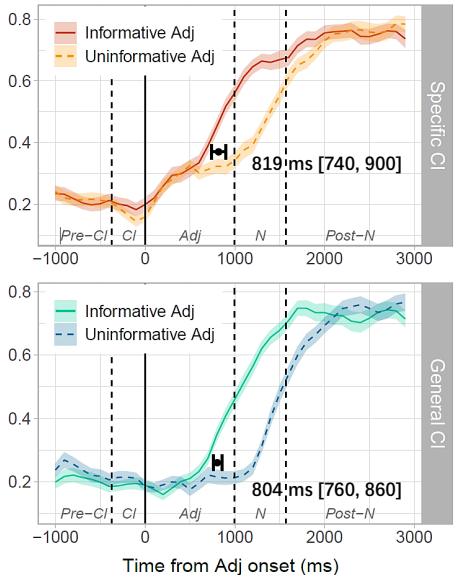

Figure 3. Proportion of fixations to the unexpected target object, time-locked to the adjective onset (0 ms). Points indicate the bootstrap means of the onset of divergence. Error bars represent 95% percentile confidence intervals.

Reference:
[1] Kamide et al. (2003). J Mem Lang. [2] Altmann & Kamide. (2007). J Mem Lang. [3] Chow & Chen. (2020). Lang Cogn Neurosci. [4] Chen, et al. (2022). AMLaP28, York, UK. [5] Szewczyk, et al. (2022). J Exp Psychol Learn Mem Cogn. [6] Husband & Bovolenta. (2020). Lang Cogn Neurosci. [7] Stone, et al. (2021). Biling: Lang Cogn.