

Investigating the Impact of Contextual Information on L2 Garden Path Sentence Comprehension

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1. Background

Understanding sentence comprehension, especially under ambiguity, is a core goal of psycholinguistics. Garden-path sentences are a widely used tool for examining how readers form an initial analysis and then revise it later when disambiguating information forces reanalysis (Frazier & Rayner, 1982). For example, in sentence “Since Jay always jogs a mile seems like a very short distance to him.”, the noun phrase *a mile* is initially interpreted as the object of *jogs*, but the later verb *seems* triggers reanalysis, revealing *a mile* as the subject of the main clause.

A large body of L1 research suggests that multiple cues can shape garden-path sentence processing. Lexical information such as verb bias (i.e., verbs differ in their preferences for taking a direct object vs. a clausal complement; e.g., *wished* is strongly clausal-biased whereas *forgot* allows both) has been argued to influence parsing either during the initial analysis or primarily during later reanalysis, with mixed findings across studies (e.g., Ferreira & Henderson, 1990; Holmes, Stowe, & Cupples, 1989; Trueswell, Tanenhaus, & Kello, 1993; Garnsey et al., 1997). Overall, however, the literature suggests that readers can make use of verb-bias information early in processing, and that such lexical expectations can modulate the strength of garden-path effects. Beyond such lexical constraints, studies also found that discourse context and semantic plausibility can also guide ambiguity resolution in L1 processing (Altmann, Garnham, & Dennis, 1992; Garnsey et al., 1997).

Research on L2 sentence processing has similarly examined whether L2 learners recruit syntactic, lexical, and semantic information in resolving temporary ambiguities. Studies have shown that L2 readers can use cues such as verb transitivity and plausibility to disambiguate garden-path sentences, though they may still show greater difficulty in reanalysis and ultimate interpretation than native speakers (e.g., Juffs & Harrington, 1996; Felser & Roberts, 2011; Hopp, 2015; Dussias & Cramer Scaltz, 2008). Importantly, Jacob and Felser (2016) reported that L2 readers were more likely than L1 readers to persist with an initial misanalysis and had greater difficulty fully revising it, as reflected in more garden-path-consistent answers on comprehension questions.

There is some evidence that L2 readers can use discourse-level and referential context to guide ambiguity resolution. Pan and Felser (2011) investigated Chinese

learners of English processing PP-attachment ambiguities in a self-paced reading paradigm and manipulated referential context in the preceding discourse (e.g., introducing one vs. two potential referents). Their results suggested that L2 could integrate discourse-level referential information online, showing facilitated processing when the context supported the preferred attachment. Pozzan and Trueswell (2016) examined L2 adults' use of visual referential context in a visual-world paradigm with temporarily ambiguous spoken instructions and found that L2 participants were sensitive to referential context during online processing. However, their act-out responses indicated that L2 learners experienced greater difficulty revising an initially committed interpretation. Importantly, Pan and Felser's (2011) self-paced reading data mainly capture which attachment is preferred in a given context, rather than tracking the full reanalysis process when that preferred structure later turns out to be incorrect. Pozzan and Trueswell's (2016) act-out and eye-movement measures directly speak to revision difficulty, but their paradigm relies on rich visual scenes and spoken instructions. Because participants continuously view a visual display while listening, it remains unclear whether L2 would show the same pattern in a written sentence-reading paradigm, where no stable visual context is available and readers must rely primarily on preceding linguistic discourse. The present study addresses these gaps by examining L2 readers' processing of garden-path sentences in written discourse, systematically manipulating contextual information and distinguishing between initial analysis and later recovery to assess how context modulates each stage.

This study examines whether preceding discourse context modulates L2 learners' processing of written garden-path (GP) sentences, focusing on (i) initial parsing decisions and (ii) recovery from initial misanalysis. The design was adapted from Jacob and Felser (2016) and extended by manipulating discourse-level semantic context. It aims at addressing two questions: (1) Does contextual semantic information influence L2 learners' initial analysis of GP sentences? (2) Do L1 and L2 readers differ in the extent to which context helps prevent persistent misinterpretations?

Two accounts make contrasting predictions about L2 use of discourse context during garden-path processing. Under the Shallow Structure Hypothesis (Clahsen & Felser, 2006, 2018), L2 learners rely more on semantic/pragmatic information; therefore, supportive context should modulate reading times across regions and improve comprehension accuracy. In contrast, resource limitation accounts predict reduced online integration of multiple cues (e.g., McDonald, 2006; Hopp, 2010; Sorace, 2011; Şafak & Hopp, 2022), yielding weaker or absent context effects in reading times, although comprehension accuracy may still show context sensitivity.

2. Methods

2.1. Participants

Two tasks were conducted with different participant groups.

Task 1 (Sentence acceptability). Four native English speakers completed an acceptability judgment task to validate the experimental items.

Task 2 (Self-paced reading). Twenty-nine participants completed an online self-paced reading task: 5 native English speakers and 24 Chinese L2 learners of English. All participants completed a language background questionnaire and the LexTALE proficiency test (Lemhöfer & Broersma, 2012). Native speakers scored highly on LexTALE ($M = 95/100$), while L2 learners showed a wider range ($M = 76/100$). A one-way ANOVA indicated no significant LexTALE differences across the four L2 groups, $F(3,20) = 2.37$, $p = .101$.

2.2. Materials and Design

The experiment used a 2×2 design crossing Ambiguity (Ambiguous vs. Unambiguous) and Context (Semantic match vs. Semantic mismatch). Sentences were adapted from Jacob and Felser (2016).

Example conditions are shown below (comma = Unambiguous):

(a) Unambiguous + Match

The milk had been freshly delivered that morning. While the girl was drinking, the milk was already being removed from the fridge.

(b) Ambiguous + Match

The milk had been freshly delivered that morning. While the girl was drinking the milk was already being removed from the fridge.

(c) Unambiguous + Mismatch

The milk had expired and needed to be discarded. While the girl was drinking, the milk was already being removed from the fridge.

(d) Ambiguous + Mismatch

The milk had expired and needed to be discarded. While the girl was drinking the milk was already being removed from the fridge.

End of trial question

Was the girl drinking the milk?

In the ambiguous condition (no comma), the noun phrase the milk is temporarily ambiguous because it can initially be interpreted as the direct object of the optionally transitive verb drinking, or alternatively as the subject of the upcoming main clause. In the unambiguous condition, a comma after the subordinate clause prevents this initial misinterpretation.

Context manipulation. Context was manipulated by varying the plausibility of the potential garden-path interpretation (drinking the milk). In the match condition, the lead-in sentence supported the direct-object interpretation (e.g., the milk is fresh and drinkable). In the mismatch condition, the lead-in sentence established an incompatible discourse context (e.g., the milk is expired and should be discarded), making the direct-object interpretation less plausible.

Regions of interest. Following Jacob and Felser (2016), two disambiguation regions were defined to examine reanalysis. The syntactic disambiguation region

(e.g., was already) provides the first structural cue that conflicts with the object analysis and thus indexes online syntactic reanalysis. The later semantic disambiguation region (e.g., being removed from the fridge) introduces event-level information incompatible with the initial interpretation, allowing us to test whether readers retain residual semantic representations after reanalysis (Ferreira, 2002). After each item, participants answered a binary comprehension question: “Was the girl drinking the milk?” The correct response was always No, since “the milk” is the subject of the main clause in all target sentences. Incorrect Yes responses were interpreted as evidence of semantic persistence from the initial misanalysis.

Item selection and fillers. Candidate items were first evaluated in an acceptability task (1–10 scale) completed by native English speakers. Items with mean ratings below 8 were excluded. Sixteen target items were selected ($M = 9.06$, $SD = 1.01$). The full experiment contained 50 sentences: 2 practice trials, 16 target items, and 32 fillers. Comprehension questions followed all trials, and the proportion of “Yes” and “No” responses was balanced overall (50% each) to reduce response bias.

2.3. Procedure

Task 1 (acceptability) was administered before the reading study to validate the materials.

In Task 2, participants first completed the language background questionnaire and LexTALE. They then completed a moving-window self-paced reading task online. Sentences were presented one segment at a time; participants advanced through each sentence by key press, and reading times were recorded for each region. After each sentence, participants answered the comprehension question.

3. Data Analysis and Results

3.1. Comprehension accuracy

Comprehension was assessed using a binary end-of-trial question (“Was the girl drinking the milk?”). Correct responses were No for all target items. Overall accuracy was higher for native English speakers ($M = 68\%$, $SD = 14.3\%$) than for Chinese L2 learners ($M = 52\%$, $SD = 13\%$). Mean response patterns by condition are shown in Figure X. Error bars are reported for the L2 group only due to the small L1 sample size ($n = 5$). Visual inspection of Figure 1 suggests that, in the ambiguous condition, mismatch contexts may be associated with fewer incorrect “Yes” responses for L1 readers, whereas a comparable trend is not clearly observed for L2 readers. Accuracy data were analyzed using a logistic mixed-effects model (Jaeger, 2008) with Ambiguity (ambiguous vs. unambiguous), Context (match vs. mismatch), and Group (L1 vs. L2) as fixed effects, and random intercepts for participants and items (with the maximal converging random-effects structure). The analysis showed no significant main effects or interactions (all $ps > .10$). Thus, neither ambiguity nor contextual match/mismatch reliably influenced offline comprehension accuracy in this dataset. This divergence

between the descriptive pattern in Figure 1 and the inferential results will be discussed further in the Discussion section.

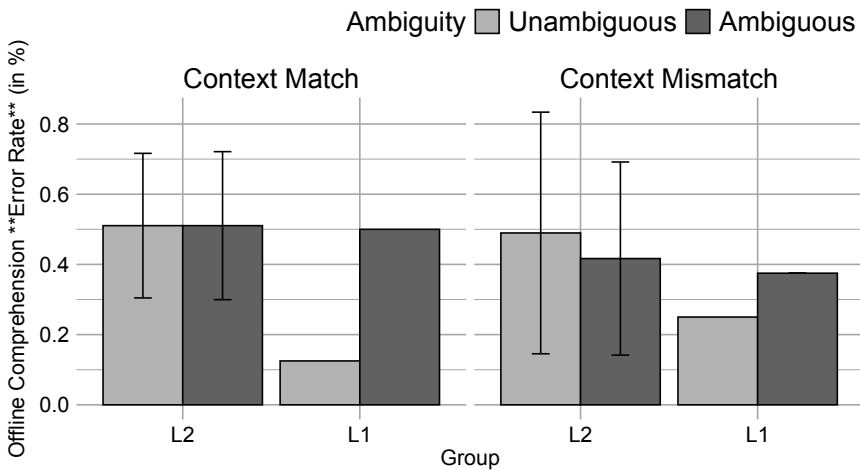


Figure 1. Mean proportions of incorrect “yes” responses by condition for the native language (“L1 English”) and non-native language (“L1 Chinese”) groups. Error bars represent 95% confidence intervals.

3.2. Reading times

Reading times were analyzed for three post-manipulation regions: (1) syntactic disambiguation (e.g., was already), (2) semantic disambiguation (e.g., being removed), and (3) the sentence-final PP (e.g., from the fridge). Reaction times shorter than 100 ms or longer than 10,000 ms were excluded (7.12% of datapoints). Reading times were log-transformed and analyzed using linear mixed-effects models (Baayen et al., 2008) with Ambiguity, Context, Group, and their interactions as fixed effects, and the maximal converging random-effects structure.

L1 English

Mean reading times for L1 readers are presented in Figure 2. Across regions, L1 readers showed a robust effect of context, with mismatch contexts producing longer reading times than match contexts. This mismatch-related slowdown was especially pronounced in the ambiguous condition and increased across the sentence, becoming largest in the final region. In the mixed-effects analyses, context significantly influenced reading times in the syntactic disambiguation region ($p < .001$), with no reliable Ambiguity $\times$ Context interaction ($p > .05$). In the semantic disambiguation region, context again showed a significant effect ($p < .001$), and the Ambiguity $\times$ Context interaction was significant ($p < .05$), indicating a stronger mismatch effect when sentences were ambiguous. Overall,

these results suggest that native readers rapidly incorporated discourse context during reanalysis, particularly when an initial garden-path interpretation was likely.

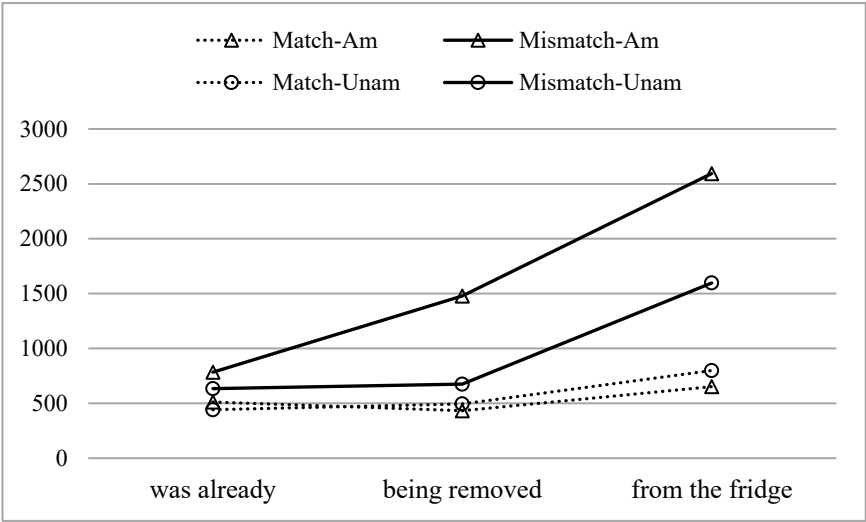


Figure 2. Mean reading times by condition and region for L1 English readers.

L2 English (L1 Chinese)

Mean reading times for L2 readers are shown in Figure 3. In contrast to the L1 pattern, L2 readers did not show a consistent mismatch-related slowdown across regions. In the syntactic disambiguation region, context did not significantly influence reading times ($p > .05$). In the semantic disambiguation region, context effects were weaker and less stable than in L1 readers, and the overall pattern across conditions was more variable. Taken together, the L2 reading-time results suggest reduced and less consistent online use of discourse context during written garden-path reanalysis compared to native speakers.

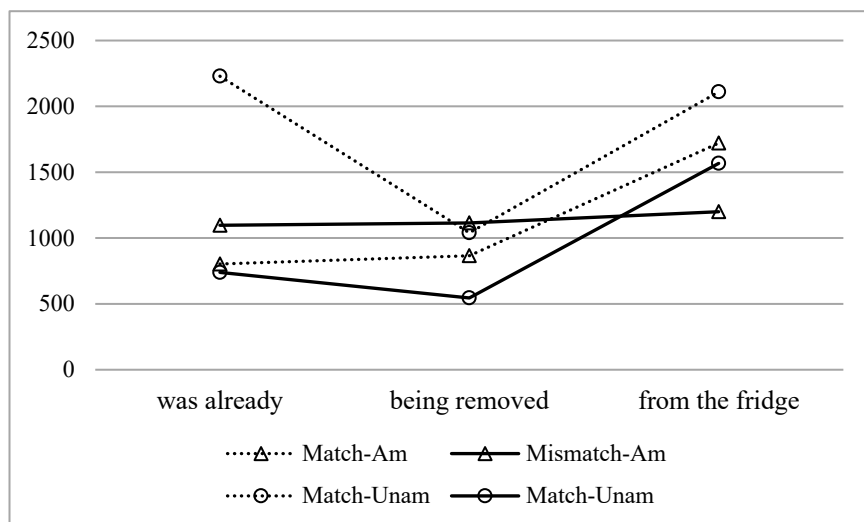


Figure 3. Mean reading times by condition and region for L1 Chinese (L2 English) readers.

4. Discussion

This study examined whether preceding discourse context supports L2 learners' processing of written garden-path sentences, focusing on both online reading-time measures and offline comprehension accuracy. The reading-time results showed a clear group asymmetry: native English readers were strongly sensitive to contextual mismatch during the disambiguation regions, suggesting that they integrated discourse context online during reanalysis, whereas Chinese L2 learners showed reduced and less consistent context effects in reading times, indicating weaker online use of contextual information.

Turning to offline comprehension, accuracy did not show reliable effects of ambiguity, context, or their interactions in the mixed-effects analysis. Nevertheless, the descriptive pattern suggested by the accuracy plot points in the same direction as the reading-time results for L1 readers: in the ambiguous condition, mismatch contexts appeared to reduce garden-path-consistent errors for native speakers, while a comparable trend was not clearly observed for L2 readers.

The apparent conflict between the descriptive pattern and the non-significant inferential results may be due to at least two factors. First, statistical power for the L1 group was limited (only five native speakers in the self-paced reading task), making it difficult to detect condition differences statistically. Second, the context manipulation may not have been consistently strong enough to create a clear semantic contradiction with the garden-path interpretation across all items. For example, in an item like "The burgers had gone cold. While the gentleman was eating the burgers were still being reheated in the microwave", the lead-in context does not strongly rule out the garden-path interpretation (eating the burgers),

because burgers being cold can still be compatible with someone eating them (or beginning to eat them) before reheating. If mismatch contexts do not robustly block the initial interpretation, they may reduce the likelihood of observing stable accuracy differences, especially for L2 readers.

The findings bear directly on two competing accounts of L2 sentence processing. Under the Shallow Structure Hypothesis (Clahsen & Felser, 2006, 2018), L2 learners are predicted to rely relatively more on semantic and discourse information than detailed syntactic representations. A straightforward prediction is therefore that contextual plausibility, especially an explicitly mismatching context, should facilitate reanalysis and reduce persistence of garden-path interpretations. However, the present online results do not show strong evidence that L2 readers consistently exploited discourse context during real-time reanalysis. Instead, the L2 pattern is more compatible with approaches emphasizing general cognitive constraints and limited processing resources in L2 comprehension (e.g., McDonald, 2006; Hopp, 2010; Sorace, 2011; Şafak & Hopp, 2022). On this view, integrating multiple cues (syntactic disambiguation, contextual plausibility, and event-level semantics) may be difficult under time pressure, leading to weakened or inconsistent context use during online processing, even if learners can sometimes draw on context in offline judgments.

Future work could test larger and more balanced L1/L2 groups, strengthen discourse context (e.g., by using multi-sentence contexts or more explicit pragmatic constraints), and employ higher-resolution online methods (e.g. eye-checking, eeg) to localize reanalysis more precisely. Beyond methodological implications, the present findings also suggest potential pedagogical relevance: if L2 learners show reduced online integration of discourse context during ambiguity resolution, instruction may benefit from training learners to coordinate contextual information with syntactic cues. For instance, processing-based activities that explicitly target recovery from temporary ambiguities may help learners strengthen real-time integration mechanisms during reading.

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