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RESOLVING STRUCTURAL AMBIGUITY IN ENGLISH RELATIVE CLAUSES AND PREPOSITIONAL PHRASES

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Abstract

Structural ambiguity remains a persistent challenge in English comprehension, particularly when relative clauses (RCs) and prepositional phrases (PPs) admit multiple interpretations. While much research has examined native speakers or beginning L2 learners, little is known about how advanced learners apply formal syntactic knowledge to disambiguate such structures. This study addresses that gap by investigating how Indonesian EFL undergraduates resolve ambiguity using structural relation patterns—dominance, precedence, and c-command. A qualitative design was employed with 30 English Education majors who had completed a syntax course. Data were collected through tree-diagram tasks and a structured questionnaire, enabling structural and reflective insights. Findings revealed three main strategies: sorting by node, ignoring non-potential nodes, and using punctuation, with late closure as the most dominant approach. Structural analysis showed that while dominance and precedence guided parsing partially, c-command consistently supported accurate disambiguation when reinforced by semantic plausibility. Frequent reactivation also indicated that learners revised their interpretations when implausibility arose, demonstrating interactive rather than strictly structural parsing. The study contributes to syntactic theory by extending the role of c-command to advanced L2 contexts, parsing research by showing interactive strategy use, and pedagogy by advocating explicit instruction on structural relations combined with cognitive strategy training. These insights inform advanced grammar curricula and highlight the need for integrated approaches to ambiguity resolution in academic English.

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INTRODUCTION

Understanding complex texts in English requires a deep command of syntactic structures. Syntax offers readers and learners of English a framework for interpreting the relationships among words, phrases, and clauses in a way that facilitates coherent meaning construction (Carnie, 2006; Radford, 2009). However, syntactic well-formedness does not always guarantee logical interpretation. One of the most persistent barriers in this regard is structural ambiguity, where a sentence permits multiple interpretations due to its syntactic configuration rather than lexical choice (Frazier & Rayner, 1982; Traxler et al., 1998). These ambiguities can significantly affect reading fluency and comprehension, particularly in academic or formal texts.

Among the many forms of ambiguity, structural ambiguity is especially challenging for English learners, as it demands a sophisticated parsing mechanism that accounts for multiple syntactic possibilities (Piantadosi et al., 2012). For example, in the sentence "The son of the

driver with the moustache was pretty cool," ambiguity arises from the attachment site of the prepositional phrase (PP) with the moustache—whether it modifies the driver or the son (MacDonald et al., 1994; Trueswell et al., 1994). These ambiguities are not merely pedagogical curiosities; they reflect the deep interface between syntax and processing strategies such as minimal attachment, late closure, and thematic role assignment (Frazier & Clifton, 1996; Gorrell, 1995; Lau, 2025; Papadopoulou & Clahsen, 2006).

Parsing such structures involves applying hierarchical syntactic relations such as precedence, dominance, and c-command—concepts derived from generative grammar (Chomsky, 1981; Frank & Vijay-Shanker, 1995). These notions help learners determine which syntactic constituent governs another, thereby resolving ambiguity (Resnik & Hearst, 1993; Hindle & Rooth, 1993). The concept of c-command, in particular, has proven essential in distinguishing between arguments and adjuncts and plays a critical role in scope interpretation (Hornstein et al., 2005; De Vries, 2018).

Recent psycholinguistic and corpus-based studies underscore that structural, semantic, and discourse-level cues mediate ambiguity resolution. For instance, attachment preferences in relative clauses (RCs) and PPs are affected by cross-linguistic factors such as the availability of pseudo-relatives and discourse coherence expectations (Pozniak et al., 2019; Rohde et al., 2011). In French and Spanish, speakers often prefer simpler pseudo-relative constructions, especially when discourse cues promote locality (et al., 2021). Similarly, extraposition in German relative clauses has been shown to introduce spurious ambiguity, which speakers manage using anaphoric cues (Crysmann, 2005). More recent studies confirm that these discourse-driven effects extend to bilingual learners, suggesting that syntax alone cannot fully explain ambiguity resolution (Luk & Darzhinova, 2024; Rentillo, 2021; Triantafyllidou et al., 2024).

Moreover, recent research highlights that L2 parsing cannot be fully explained by syntactic models alone, but is profoundly shaped by cognitive factors such as working memory, inhibitory control, and proficiency. While closer to native-like performance, advanced learners still experience reanalysis difficulties in garden-path sentences (Pozzan & Trueswell, 2016) and rely more heavily on plausibility information than structural cues during ambiguity resolution (Berghoff, 2020). Cognitive load and executive control have been shown to mediate efficiency in L2 processing, with higher proficiency linked to better integration of bottom-up and top-down mechanisms (Perez et al., 2019; Yang et al., 2022; Goh, 2023). These findings suggest that ambiguity resolution involves a dynamic interaction between syntactic relations and cognitive processing, especially for learners navigating complex academic English. Recent neurolinguistic studies also show that working memory and auditory processing remain critical in determining reanalysis success, reinforcing the role of cognitive load in ambiguity resolution (Zhang et al., 2024; Saito et al., 2024).

The role of lexical-semantic factors is also evident in PP attachment. Felser et al. (2003) demonstrated that prepositions like of or with can prime different attachment interpretations depending on their semantic load. Furthermore, bilinguals' exposure to multiple syntactic systems can modulate their preferences, as seen in Brazilian Portuguese-English bilinguals with higher tolerance for preposition stranding in relative clauses (Augusto & Orlando, 2023). At the same time, factors such as age of acquisition (Fromont, 2023), working memory capacity (Li, 2023), and auditory processing skills (Saito et al., 2024) have emerged as key predictors of how efficiently learners parse ambiguity across contexts. For second language (L2) learners, parsing ambiguity is even more demanding. Studies show that non-native speakers often exhibit attachment preferences shaped by their L1, diverging from native-like processing patterns (Cuetos & Mitchell, 1988; Carreiras & Clifton, 1993). In addition, learners from different language backgrounds demonstrate varying abilities to deploy punctuation (e.g., commas) to

facilitate written disambiguation (Kurniasari, 2017), while cognitive constraints such as working memory further mediate their processing capacity.

Despite the depth of prior research, there remains a critical gap: few empirical studies have operationalised structural relations (dominance, precedence, and c-command) in experimental designs with advanced L2 learners. Most existing work focuses on native speakers or beginning learners, leaving university-level learners of syntax underexplored. Addressing this population is essential, since their exposure to formal instruction equips them with metalinguistic knowledge but does not guarantee native-like processing efficiency (Ellis & Wulff, 2020).

Accordingly, this study investigates how advanced Indonesian EFL students parse structurally ambiguous sentences involving relative clauses and prepositional phrases. Specifically, it asks: How do advanced EFL students apply steps to disambiguate relative clauses and prepositional phrases? And How can structural relation patterns (dominance, precedence, c-command) explain learners' strategies in resolving ambiguity? This research contributes to syntactic theory, L2 parsing scholarship, and pedagogy by foregrounding the interplay between structural knowledge and cognitive processing. Its findings can inform advanced grammar curricula integrating explicit instruction on structural relations, thereby equipping learners with more analytical strategies for ambiguity resolution in academic English.

RESEARCH METHOD

Research Design

This study employed a qualitative research design to explore how advanced EFL learners parse and resolve structural ambiguity in English sentences, particularly those involving relative clauses (RCs) and prepositional phrases (PPs). The approach emphasised interpretive analysis through syntactic parsing tasks, questionnaires, and theory-grounded reflections. A qualitative design was selected because this study focuses on outcomes (e.g., correct or incorrect parsing) and learners' processes and reasoning strategies. Such a design captures the richness of participants' metalinguistic awareness and cognitive strategies, which may not be fully observable in purely quantitative experiments (Creswell & Poth, 2018).

Research Participants

The participants comprised 30 undergraduate students majoring in English Education at STKIP Paracendekia NW Sumbawa. All had completed the "English Syntax" course, ensuring a homogeneous group with foundational syntactic knowledge. Their academic background rendered them suitable subjects for evaluating how instruction in structural relations aids ambiguity resolution. A qualitative design was selected because this study focuses on outcomes (e.g., correct or incorrect parsing) and learners' processes and reasoning strategies. Such a design captures the richness of participants' metalinguistic awareness and cognitive strategies, which may not be fully observable in purely quantitative experiments (Creswell & Poth, 2018).

Research Materials

Six syntactically ambiguous sentences were used as test items, adapted from Traxler et al. (1998), each designed to test different attachment sites for RCs and PPs. These sentences varied in structure (e.g., NP + PP vs. NP + CP) to examine the nature of ambiguity and resolution strategies. The key sentence types included:

The car of the driver with/that had the moustache was pretty cool.

The driver of the car with/that had the moustache was pretty cool.

The son of the driver with/that had the moustache was pretty cool.

Each was carefully chosen to highlight potential parsing conflicts stemming from multiple syntactic attachment possibilities. The items were piloted with five non-participant students of similar backgrounds to ensure clarity and appropriateness; their feedback was used to refine sentence wording and confirm that the intended ambiguity was recognised.

Instruments

Three main instruments were deployed. First, using the "Tree Diagram Task", participants were required to construct syntactic tree diagrams for each sentence. This task was designed to reveal their parsing strategies, highlighting which node (NP, PP, or CP) they interpreted as dominant or c-commanding within the structure (Carnie, 2006; Hornstein et al., 2005). The reliability of this task was checked through expert review: two linguistics lecturers examined the items and confirmed their validity in representing typical structural ambiguities.

Second, a Structured Questionnaire was administered. This Likert-scaled questionnaire measured participants' metacognitive reflections on ambiguity resolution strategies. Key questions involved decision points (e.g., "Do you think the moustache refers more naturally to the car or the driver?"), parsing revisions (e.g., "Did you reconsider your initial interpretation?") and punctuation use (e.g., "Would adding a comma after 'driver' change your interpretation?"). The questionnaire was pre-tested for clarity with the same pilot group, and ambiguous wording was revised. Internal consistency reliability was checked, yielding a Cronbach's alpha of 0.81.

Third, integrating literature, syntactic theories, and parsing models was used as an analytical framework to interpret participants' outputs. This included concepts such as minimal attachment, late closure (Frazier & Clifton, 1996), dominance and c-command (Frank & Vijay-Shanker, 1995), and thematic role assignment (Trueswell et al., 1994).

Data Collection Procedure

Data collection proceeded in two stages. Stage 1 – Syntax Task, as a supervised session, students completed the tree-diagramming activity. Each sentence was presented in isolation, and participants had 10 minutes per item to complete the diagrams. Stage 2 – Questionnaire, following the syntax task, participants completed the questionnaire, which probed their cognitive rationale, including any shifts in interpretation or revision patterns. In both stages, instructions were given in English but clarified in Indonesian when necessary to avoid misinterpretation. Written consent was obtained, and anonymity was ensured. The data collection process ensured that both implicit syntactic knowledge and explicit decision-making strategies were captured.

Data Analysis

Qualitative content analysis was used to examine the diagram outputs and questionnaire responses. Diagrams were coded based on node alignment (i.e., whether PP was attached to NP1 or NP2) and the application of structural principles such as: Dominance: Higher nodes overriding substructures (Carnie, 2006); Precedence: Left-to-right reading influence (Hornstein et al., 2005); and C-command: Evaluation of node relationships in hierarchical parsing (Frank & Vijay-Shanker, 1995)

To enhance rigour, coding was carried out independently by two trained raters. Inter-rater reliability reached 87% agreement, with discrepancies resolved through discussion. Triangulation was achieved by integrating evidence from diagram outputs, questionnaire responses, and theoretical predictions, ensuring that interpretations were not based on a single data source (Miles et al., 2014). Quantitative trends from the questionnaire (e.g., percentage preference for minimal attachment or late closure) supplemented qualitative observations, enabling a richer interpretation of the data.

This dual-mode analysis allowed the identification of both dominant parsing models (e.g., autonomous vs. interactive; see Trueswell et al., 1994) and anomalies in participant processing.

RESEARCH FINDINGS AND DISCUSSION

Research Findings

This study aims to examine: i) How students learning English Syntax apply steps to disambiguate relative clauses and prepositional phrases; ii) How structural relation patterns can explain cases of ambiguous relative clauses and prepositional phrases. The results from the questionnaire distributed to participants are as follows.

Disambiguity Steps

Table 1 below summarizes one of the survey points related to participants' strategies for resolving ambiguity.

Table 1
Sentence Disambiguation Strategy

Strategies	Sentence 1	Sentence 2	Sentence 3	Average
1. Sorting by node (NP, VP, PP, etc.)	33.30%	30%	43.30%	35.53%
2. Temporarily ignoring non-potential nodes in the sentence	63.30%	53.30%	50%	55.53%
3. Putting a comma (,), punctuation on certain parts of the sentence	26.70%	36.70%	30%	31.13%

Table 1 shows that strategy two was found to be the most frequently used strategy in sentence 1 (63.30%), sentence 2 (53.30%), and sentence 3 (50%). On average, strategy 2 was the most frequently used in resolving ambiguity (55.53%). Temporarily ignoring non-potential nodes in a sentence is a step taken in applying late closure by adding new nodes to the phrase after "closing" the phrase or clause being constructed.

Using strategy 1 in the form of node-based sorting tends to refer to the minimal attachment approach. On average, strategy 1 was the second alternative used by participants (35.53%). Only in sentence 2 was strategy 2's position below that of strategy 3.

Using strategies 1 and 2, namely minimal attachment and late closure, aligns with garden path parsing theory (Frazier & Rayner, 1982). Meanwhile, strategy 3 is not part of the garden path but rather an external (orthographic) clue to resolve ambiguity. Although the average percentage of use of this external clue is the smallest according to Table 1 above (31.13%), it turns out that some participants still chose this strategy. This shows that strict structural heuristics still require other supporting factors (Berghoff, 2020; Pozzan & Trueswell, 2016), such as external clues, and an example of this is the use of commas (Carrasco-Ortiz & Frenck-Mestre, 2014).

Temporarily Ignoring Non-Potential Nodes in the Sentence

The use of this strategy still falls under the category of late closure. The questionnaire results supported the tree diagrams drawn by some participants. As an example, the tree diagram is converted into a bracket diagram below:

Example 1:

[NP1 [NP2[D1 **The**] [N1 **driver**]] [PP1 [P1 **of**] [NP3[NP4[D2 **the**] [N2 **car**]] [[PP2 [P2 **with**]] [[NP5 [D3 **the**] [N3 **moustache**]]] [VP[V **was**] [[AdjP [AdvP [Adv **pretty**][Adj **cool**]]].

By ignoring the T node ("was") in the bracket diagram in example 1 below, the participants can easily resolve the ambiguity in the sentence. By ignoring the VP node, participants can focus on NP1 (the driver of the car with the moustache). The next step is to ignore NP2 (the driver) to ascertain whether NP4 (the car) c-commands PP2, which also dominates NP5 (the moustache). This form of ignoring is the actual step of how simple nodes are identified during ambiguity parsing. This is what is meant by minimal attachment.

Resolving "garden path" sentences like the above cannot rely solely on phrase structure analysis. Structural relation analysis is an initial step in ambiguity resolution or disambiguation. This is because PP2 can refer to either NP2 or NP4. Therefore, the second strategy is likely activated by exploring discourse information related to lexical items between these nodes. The information that NP5 (the moustache), although structurally dominated by NP4 (the car), is semantically contradictory in terms of meaning. This is what is meant by a multiple constraint account. Trueswell, et.al (1994) state that the model used here is interactive. Predictions during parsing involve information from lexical, semantic, syntactic, and contextual sources.

Ignoring non-potential nodes is participants' most frequently used strategy for resolving ambiguity. In example 2 below, non-potential nodes in sentence one are set aside first to facilitate ambiguity resolution.

Example 2:

[$_{NP1}$The son of the driver with the moustache] [$_{VP}$was pretty cool].

In the sentence above, the underlined nodes are non-potential for creating ambiguity. Setting aside non-potential nodes makes it easier for participants to focus on the ambiguity by ignoring the VP ("was pretty cool"), where "was" is the head of the phrase. This also relates to minimal attachment because it focuses on establishing the simplest sentence structure.

Reactivation

Regarding one of the points in the questionnaire about whether participants revised their answers concerning the three sentences used for ambiguity identification in this study, it was found that almost half of the participants revised the noun phrase activated during initial parsing when disambiguating sentences. The rest chose not to revise. This reinforces that the three sentences contain ambiguity, leading readers to attempt resolution through a parsing activation process from one noun phrase to another. The parser functions as a preprocessor that analyzes parts of speech.

Table 2
Ambiguity Level and Reactivation Needs

No.	Sentence	Ambiguity between Noun Phrases	Reactivation of Noun Phrase	Without Reactivation
1	The car of the driver with/that had the moustache was pretty cool.	76.7%	56.7%	43.3%
2	The driver of the car with/that had the moustache was pretty cool.	56.7%	30%	70%
3	The son of the driver with/that had the moustache was pretty cool.	63.3%	56.7%	43.3%

From the three sentence types in Table 2, point number 2 has the lowest ambiguity level compared to the others (56.7%). This is also proven by the noun phrase reactivation at 30%, which means reactivation is not allocated to the parsing process in resolving ambiguity. The table also identifies that the reactivation between noun phrases for sentences one and 3 is the same at 56.7%, as is the percentage without reactivation for both sentences, at 43.3%. This implies that all participants treat both sentences similarly because they are ambiguous. The ambiguity level of these two sentences is higher than in sentence 2, as evidenced by the participants' 43.3% of "no reactivation" statements, which is significantly lower than in sentence 2 (70%). The priming process causes greater reactivation in sentences 1 and 3

compared to sentence 2. The first NP that precedes other NPs but does not prime will trigger a reactivation process.

Structural Relation Analysis

Dominance

Node A dominates node B if and only if A is higher up in the tree than B and a line from A to B goes only downwards. The treatment of domination in the sentences in this study can be observed from the example of the bracket diagram created by the participants below.

Example 3:

[NP1 [NP2[D1 ^{The}] [N1 ^{son}]] [PP1 [P1 ^{of}] [NP3[NP4[D2 ^{the}] [N2 ^{driver}]] [[PP2 [P2 ^{with}]] [[NP5 [D3 ^{the}] [N3 ^{moustache}]]] [T ^{was}] [[AdjP [AdvP [Adv ^{pretty}][Adj ^{cool}]].

Examples of dominance in sentence 3 are NP1 dominating NP2, D1 and N1, PP1 and its subordinate nodes, and PP2 and its subordinate nodes. Similarly, PP1 dominates P1, NP3, NP4, D2, and N2. PP2 also dominates P2, NP5, D3, and N3. If traced further up, NP1 (the son), PP1 (of the driver), and PP2 (with the moustache) are dominated by a noun phrase NP_0 as the root node. Sentence 3 contains ambiguity because NP4 is indicated to dominate D2 (the), N2 (the car), and PP2 (with the moustache). Structurally, this is possible because the properties of a noun phrase in syntax include NP=NP + PP. However, the semantic role demonstrates the illogicality of a noun phrase that no car has a moustache. With this logical consideration, ambiguity resolution shifts from sentence structure analysis to a multiple constraint account where discourse information at the lexical level is considered.

Dominance is limited to nodes or constituents below its structure, where NP_0, as the root node (the node that governs the entire noun phrase/sentence structure), dominates all NP1, NP2, NP3, NP4, and NP5. However, ambiguity cannot be resolved by relying solely on dominance. Therefore, c-command takes its role.

C-Command

Carnie (2006) adds that c-command requires "Node A c-commands node B if every node dominating A also dominates B, and neither A nor B dominates the other". In example 3, NP2 c-commands PP1 because they are dominated by the same "mother" node, NP1. In the case of ambiguity, NP2 (the son) c-commands PP1 (of the driver) and all nodes dominated by PP1 (P1 and NP3). This is because NP1 dominates both NP2 and PP1. Meanwhile, NP4 (the driver) can c-command PP2 (with the moustache) because it structurally meets the requirements, i.e., NP4 and PP2 are dominated by NP3. The priming between NP4 and PP2 is also close, meaning the driver will likely have a moustache.

The tree diagrams in Figure 1 and Figure 2 illustrate the structural differences in sentence no. 2, namely NP + prepositional phrase (PP) and NP + complementary phrase (CP).

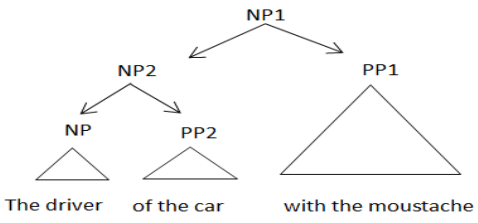

Figure 1. Tree diagram of $NP_{priming}$ c-commands PP

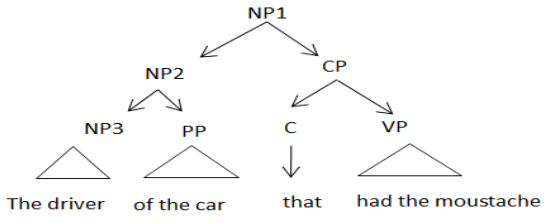

Figure 2. Tree diagram of $NP_{priming}$ c-commands CP

The survey results show a Likert scale from 1-7 to measure the time taken to disambiguate between NP+PP (Figure 1) and NP+CP (Figure 2). Scale 4 was the most dominant, indicating

that the time required for both formations was neither too long nor too short (mediocre). The percentages for both were also not significantly different, with 26.7% choosing scale 4 for NP+PP and 30% for NP+CP.

The same applies to Figures 3 and 4. It was easier to determine the logical consistency because NP2 was separated from PP. Furthermore, NP3 showed semantic illogicality; hence, the reactivation process was not overly necessary.

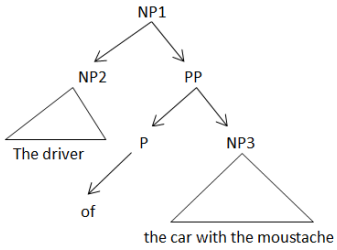

Figure 3. Tree diagram of NP c-commands $PP_{no\ priming}$

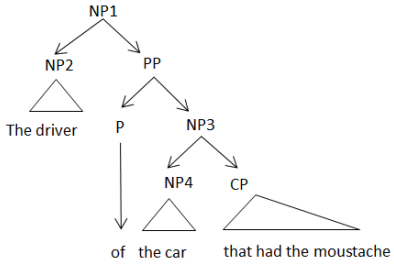

Figure 4. Tree diagram of $NP+CP_{no\ priming}$

Semantically, the one with the moustache is the car's driver. This indicates that the lowest reactivation (30%) in Table 2 occurs when two NPs are 'sisters' under the dominance of the same NP and act as a 'mother'. In such cases, the first NP (the driver) c-commands PP1 and CP, not the second NP (the car). This means participants prioritize the first appearing NP and then attempt to c-command other nodes.

Reiterating the conclusion that the first noun phrase appearing is prioritized for c-commanding other nodes, Sentence 1 in the previous Table 2 would show an overlapping effect. This is because NP ("the car") does not prime with NP ("the moustache"). Priming facilitates the identification of semantic proximity between one noun phrase and another. In essence, there is a stronger semantic connection between "driver" and "moustache" than between "car" and "moustache." This priming effect determines whether the parsing process is faster or slower. Priming can be achieved if the semantic properties possessed by the two nodes are related (Fernández & Cairns, 2010); for example, the NP "the driver" (animate +) can prime with the NP "the moustache."

In structural relation rules, the condition for c-command is that there should be no node G (a symbol indicating no sister relationship with an adjacent node) that is dominated by a sister of the same mother, which is NP1. As shown in Figure 5 (referring to the previous image), NP2 does not c-command PP because there is a node G, namely the preposition (of), which PP dominates, and NP4 (the car), which NP3 dominates. Automatically, NP2 cannot be said to c-command CP (that had the moustache), even though NP2 precedes PP.

Understanding structural relations in resolving ambiguity proved very helpful, as evidenced by the research questionnaire results. One participant stated, "Understanding this (structural relation) makes me more meticulous in interpreting sentences." Another participant also conveyed, "Syntax prevents us from misinterpreting a sentence and helps us understand it comprehensively." This reinforces the statement that even though dominance and c-command are primitive models in structural analysis, their use is still representative in resolving ambiguity.

Discussion

The findings of this study reveal intricate dynamics in how advanced Indonesian EFL learners navigate syntactic ambiguity, showcasing the interplay between structural relations, semantic cues, and cognitive control during sentence parsing. The observed tendencies—favoring late closure, reliance on c-command, and frequent reactivation under semantic

implausibility—offer a nuanced perspective on how linguistic and cognitive resources jointly shape L2 syntactic processing.

The predominance of late closure confirms foundational parsing theories proposed by Frazier and Rayner (1982), who posited that readers attach new material to the current clause or phrase whenever possible to minimize cognitive load. Yet, the Indonesian learners' responses in this study extend beyond purely structural heuristics. Their sensitivity to meaning and plausibility suggests that syntactic and semantic information are processed interactively rather than sequentially. This aligns with the interactive-compensatory perspective of L2 parsing, wherein semantic plausibility acts as an early constraint guiding syntactic attachment. Such behavior mirrors findings from Berghoff (2020) and Pozzan and Trueswell (2016), who documented that proficient L2 learners dynamically integrate both grammatical structure and contextual cues. Importantly, these results challenge rigid structural models by illustrating that advanced L2 users are not passive processors following mechanical parsing strategies; instead, they actively engage in interpretive reasoning that blends form and meaning. The interaction between syntactic structure and semantic coherence observed here resonates with the theoretical stance of Yang et al. (2022) and Goh (2023), who argue that L2 parsing competence emerges from the gradual alignment of linguistic representations and real-time meaning construction.

C-command emerged as the structural anchor in disambiguation, particularly in prepositional phrase (PP) attachments. Learners consistently resolved ambiguity by aligning the PP with the noun phrase that c-commanded it, provided the resulting relationship was semantically plausible. This demonstrates that the learners' parsing system retains sensitivity to hierarchical structure rather than linear order, highlighting an advanced level of syntactic awareness. Theoretical accounts by Hornstein et al. (2005) and Frank and Vijay-Shanker (1995) emphasize c-command as the fundamental relational principle governing syntactic dependencies, and the current findings affirm its cognitive salience in L2 processing. What makes these findings particularly significant is the learners' ability to reconcile structural hierarchy with semantic interpretability. The success of disambiguation was contingent on the plausibility of the c-commanded pair, such as "driver–moustache," suggesting that syntactic structure alone was insufficient without semantic validation. This supports the notion that L2 syntactic competence is intertwined with semantic reasoning, not divorced from it. Moreover, given that participants in this study had received explicit instruction in formal syntax, their performance indicates how metalinguistic knowledge—particularly about abstract relations like dominance and c-command—can enhance parsing efficiency. This insight extends the argument of Ellis and Wulff (2020), who highlighted the mediating role of explicit grammatical knowledge in advanced learner performance, suggesting that syntactic awareness acquired through formal education can scaffold real-time processing.

Equally revealing was the pattern of reactivation observed when learners encountered semantic implausibility. Upon detecting a mismatch between structural prediction and meaning, they revisited earlier parsing decisions to restore coherence. This behavior mirrors native speakers' garden-path recovery strategies (Trueswell et al., 1994), confirming that advanced L2 learners possess comparable adaptive mechanisms. However, the study also points to the limits of such flexibility. Learners' reanalysis often involved additional processing time and multiple attempts, reflecting a higher cognitive load than in native parsing. This echoes findings from neurolinguistic and psycholinguistic studies showing that proficiency and working memory capacity modulate revision success (Perez et al., 2019; Li, 2023). The learners' ability to reactivate prior syntactic representations illustrates a dynamic parsing process, but one constrained by the finite attentional and memory resources typical of L2 comprehension. Thus, the results support a resource-dependent model of L2 parsing, wherein syntactic knowledge and executive control interact under real-time pressure. The dynamic, iterative nature of L2 parsing

underscores the importance of integrating cognitive training with linguistic instruction to improve efficiency and automaticity in ambiguity resolution.

From a pedagogical standpoint, the implications of these findings are far-reaching. Explicit instruction in structural relations such as c-command, dominance, and constituency can provide learners with conceptual tools for analyzing and resolving ambiguity in authentic texts. Teaching syntax as a system of abstract relations rather than mere rule memorization enables learners to approach complex sentences with analytical precision. Practical methods such as tree-diagramming, clause boundary marking, and guided disambiguation tasks can make these abstract structures visible and actionable. Moreover, given that learners' parsing difficulties often stem from cognitive overload during reanalysis, instruction should not stop at grammatical explanation. It should also cultivate cognitive flexibility through exercises that train working memory, inhibitory control, and semantic plausibility monitoring. As Saito et al. (2024) argue, language pedagogy that integrates linguistic and cognitive dimensions yields more robust and transferable processing skills. Instructors could, for example, design interactive reading tasks where learners must justify their attachment decisions or revise misinterpretations under time constraints, thereby strengthening both grammatical insight and cognitive agility.

In practice, an effective EFL curriculum for advanced learners would weave together three interdependent strands: explicit grammar instruction emphasizing hierarchical relations, cognitive training that enhances reanalysis efficiency, and discourse-based activities that expose learners to naturally occurring ambiguities. This blended approach can help learners move beyond surface-level comprehension toward strategic and reflective reading, aligning their parsing behaviors more closely with native-like processing. Furthermore, the study's findings open promising avenues for further inquiry. Cross-linguistic comparisons could explore whether speakers of typologically different L1s exhibit similar reliance on c-command and late closure, while experimental methods such as eye-tracking or ERP could reveal the temporal dynamics of reactivation and disambiguation. Pedagogically, intervention studies that combine syntax-focused and cognition-based training would provide valuable evidence on how to optimize instruction for parsing efficiency and interpretive accuracy.

The evidence underscores that advanced Indonesian EFL learners engage in an intricate balancing act between structure, meaning, and cognitive control. Their parsing behavior reflects not a deficit but an adaptive competence that operates within the bounds of limited processing resources. By acknowledging the interaction between syntactic structure, semantic plausibility, and cognitive mechanisms, this study contributes to a more integrated understanding of L2 sentence processing—one that bridges theoretical linguistics, psycholinguistics, and pedagogy.

CONCLUSION

This study has illuminated how advanced EFL learners resolve structural ambiguity in English noun phrases that contain relative clauses (RCs) and prepositional phrases (PPs). The first research question asked how students applied the steps to disambiguate ambiguous sentences. The findings revealed three primary strategies: sorting by node, ignoring non-potential nodes, and using punctuation. Among these, minimal attachment through ignoring non-essential nodes emerged as the dominant approach, although punctuation and semantic plausibility also played a role.

The second research question asked how structural relation patterns—dominance, precedence, and c-command—could explain learners' strategies. Results showed that while dominance and precedence helped learners identify possible structures, they did not consistently yield accurate interpretations. C-command, however, proved most effective in guiding correct parsing, particularly when reinforced by semantic plausibility. Reactivation further indicated that learners were not passive parsers but actively revised their interpretations when faced with implausible pairings.

These findings make three contributions. First, to syntactic theory, they extend the explanatory value of structural relations—especially c-command—into L2 contexts, demonstrating that advanced learners can use formal syntactic knowledge to guide parsing. Second, L2 parsing research reveals that advanced learners adopt interactive strategies that combine structural heuristics and semantic plausibility, confirming that parsing is dynamic and resource-dependent. Third, in terms of pedagogy, the study highlights the importance of integrating explicit instruction on structural relations with training in reanalysis and plausibility checking, thereby equipping learners with theoretical and cognitive tools for managing ambiguity in academic English. Overall, the study demonstrates that ambiguity resolution in L2 is not a matter of choosing between syntax and semantics, but of orchestrating them interactively. By foregrounding the interplay of structural knowledge and cognitive processing, this research underscores the need for advanced EFL instruction that combines grammar teaching with strategy training, preparing learners to handle the complexity of authentic English texts with greater analytical precision.

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