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The Role of Working Memory in Shaping EFL Learners' Sentence Complexity

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Abstract: Sentence complexity is widely regarded as an indicator of second language proficiency, yet many EFL learners struggle to produce structurally complex sentences despite having adequate grammatical knowledge. This study investigates the role of working memory in shaping EFL learners' sentence complexity from a psycholinguistic perspective. Rather than treating sentence complexity as a purely linguistic outcome, the study examines it as a product of cognitive capacity during language production. Using a qualitative design, the study involved ten undergraduate EFL learners who completed sentence production tasks followed by stimulated recall interviews. The production data were analyzed to identify patterns of sentence complexity, while the interview data were used to explore learners' cognitive experiences during sentence construction. The findings reveal that working memory strongly constrains learners' ability to produce complex sentences. When cognitive load increased, learners consistently simplified sentence structure by reducing clause embedding and sentence length. Learners reported difficulty maintaining multiple linguistic elements simultaneously, particularly when lexical retrieval and grammatical organization competed for limited working memory resources. As a result, learners often prioritized meaning clarity and sentence completion over structural complexity. The study also shows that learners were aware of their working memory limitations and consciously adjusted sentence structure to manage cognitive demands. These findings support resource-limited models of language production and highlight working memory as a key factor influencing syntactic performance in EFL contexts. Pedagogically, the study suggests that expectations of sentence complexity should consider cognitive constraints and task conditions. Recognizing the role of working memory can lead to more realistic instruction, better task design, and fairer assessment of learner proficiency.

Keywords: Working Memory, Sentence Complexity, EFL Leraners, Psycholinguistics

INTRODUCTION

Sentence complexity is a central indicator of second language development. In EFL contexts, learners are often expected to produce sentences that are not only grammatically accurate but also structurally varied and cognitively demanding. Complex sentences allow learners to express relationships between ideas, show logical organization, and demonstrate higher-level language competence (Moustaghfir & Ramila, 2025). However, many EFL learners struggle to produce complex sentence structures consistently, especially in spontaneous speaking and academic writing. This difficulty cannot be explained solely by limited grammatical knowledge. Cognitive factors, particularly working memory, play a crucial role in shaping learners' ability to construct complex sentences.

Working memory refers to the limited cognitive system responsible for temporarily storing and manipulating information during ongoing tasks (Baddeley,2020). In language production, working memory supports multiple processes simultaneously, including idea generation, lexical retrieval, syntactic organization, and self-monitoring. When learners attempt to produce complex sentences, these processes place high demands on working memory capacity. Unlike native speakers, EFL learners often lack

automaticity in grammar and vocabulary use. As a result, they rely more heavily on controlled processing, which increases cognitive load and constrains sentence complexity.

Psycholinguistic theories of language production emphasize that sentence formation is not a linear process. Speakers must hold conceptual information in mind while selecting words and organizing them into syntactic structures (Izumi, 2003). For EFL learners, this process becomes more demanding as sentence complexity increases. Producing subordinate clauses, embedded structures, or extended noun phrases requires learners to maintain multiple linguistic elements in working memory at the same time. When working memory resources are insufficient, learners tend to simplify sentence structure, reduce clause length, or avoid complex constructions altogether (Carpenter, & Just, 2013).

Previous research in second language acquisition has shown a relationship between working memory capacity and various aspects of language performance, such as fluency, accuracy, and vocabulary use (Wen, 2012). However, many studies focus on quantitative measures and test-based tasks, such as reading span or digit span tests. While these studies establish correlations, they often fail to explain how working memory operates during real-time sentence construction. In particular, there is limited qualitative research that explores how working memory constraints shape learners' choices when producing sentences of varying complexity.

In EFL classrooms, sentence complexity is frequently treated as a purely linguistic issue. Instruction emphasizes grammar rules, sentence patterns, and model texts. Learners are encouraged to use complex sentences, yet little attention is given to the cognitive demands involved in producing them. As a result, learners may know complex structures declaratively but fail to use them in actual communication. This gap between knowledge and performance suggests that cognitive capacity, rather than grammatical awareness alone, influences sentence complexity.

Working memory limitations can explain why learners often produce simpler sentences under pressure. During speaking tasks, learners must plan content and form simultaneously within limited time (Li & Fu2018). When working memory becomes overloaded, learners prioritize meaning delivery over structural complexity (Meguerdichian, Walker, & Bajaj, 2016). In writing tasks, although time pressure is reduced, learners still face cognitive demands related to planning, revising, and monitoring. Learners with lower working memory capacity may rely on familiar sentence patterns to reduce cognitive strain, leading to repetitive and structurally simple writing.

Despite the relevance of working memory to sentence complexity, this relationship remains underexplored from a psycholinguistic perspective in EFL contexts. Many existing studies treat sentence complexity as an outcome variable without examining the cognitive processes behind it. There is a lack of research that investigates how learners experience cognitive load during sentence production and how working memory influences their structural decisions. Understanding this relationship requires methods that go beyond test scores and capture learners' real-time processing and reflections.

A qualitative approach offers valuable insight into this issue. By examining learners' sentence production alongside introspective data, researchers can explore how working memory constraints manifest during language use. Such an approach allows learners to explain why they choose certain structures, avoid others, or simplify sentences under specific conditions. This perspective shifts the focus from what learners produce to how and why they produce it.

The present study addresses this gap by examining the role of working memory in shaping EFL learners' sentence complexity. It explores how working memory capacity influences learners' ability to construct complex sentences during language production. Rather than measuring working memory as an abstract score, this study investigates its functional role during sentence planning and construction. It seeks to understand how cognitive load affects learners' structural choices and how learners manage limited cognitive resources (Jiang, Abbuhl & Fu, 2025).

The study aims to achieve three objectives. First, it seeks to identify patterns of sentence complexity in EFL learners' spoken or written production. Second, it examines how learners experience cognitive load when producing complex sentences. Third, it explores learners' perceptions of working memory limitations and their impact on sentence construction. These objectives lead to the following research questions: How does working memory influence the complexity of sentences produced by EFL learners? What cognitive challenges do learners experience when constructing complex sentences? How do learners manage working memory demands during sentence production?

By addressing these questions, the study contributes to psycholinguistic research on second language production. It highlights working memory as a key cognitive factor that shapes syntactic performance. Pedagogically, the study encourages teachers to consider cognitive constraints when teaching sentence complexity. Recognizing the role of working memory can lead to more realistic expectations, better task design, and instructional practices that support gradual development of complex language use.

METHODOLOGY

This study employed a qualitative psycholinguistic design to investigate how working memory shapes sentence complexity in EFL learners. The focus was placed on cognitive processes involved in sentence construction rather than on numerical measurement of working memory capacity. A qualitative approach was chosen to capture learners' real-time decision making and subjective experiences during language production (Levy, 2015).

The participants were ten undergraduate students enrolled in an English Education program at a university in Indonesia. All participants were EFL learners who had completed core courses in grammar and academic writing or speaking. Their proficiency level ranged from intermediate to upper-intermediate based on institutional placement and lecturer evaluation. The participants shared similar academic backgrounds to minimize variation related to instructional exposure. All participation was voluntary, and pseudonyms were used to ensure confidentiality.

Data collection involved two main activities. First, participants completed a sentence production task. Depending on the focus of the study, the task required participants to produce either spoken or written sentences based on visual prompts and short academic-style questions. The prompts were designed to elicit varying levels of sentence complexity, including simple sentences, compound sentences, and sentences with subordinate clauses. Participants were encouraged to express ideas freely without being instructed to use specific grammatical structures. This allowed sentence complexity to emerge naturally.

Second, stimulated recall interviews were conducted immediately after the production task. Participants were asked to review selected parts of their own spoken or written output that showed changes in sentence complexity. During the interview, they were prompted to explain what they were thinking when producing those sentences. The questions focused on cognitive effort, memory load, and difficulties in managing multiple linguistic elements. The interviews aimed to reveal how participants experienced working memory demands during sentence construction. All interviews were audio recorded and transcribed verbatim.

Data analysis followed a thematic analysis approach. Sentence production data were first analyzed to identify patterns of sentence complexity, such as clause embedding, sentence length, and structural variation. These patterns were then examined alongside interview data to identify recurring themes related to working memory constraints. Initial coding focused on indicators of cognitive load, including hesitation, simplification strategies, and avoidance of complex structures. The codes were then grouped into broader themes that reflected how working memory influenced sentence planning and execution.

To enhance credibility, triangulation was applied by comparing sentence production data with participants' introspective explanations. Member checking was conducted by allowing participants to confirm the accuracy of interpreted statements from the interviews. Through this methodological approach, the study aimed to provide a detailed account of how working memory operates as a cognitive constraint in shaping sentence complexity among EFL learners.

RESULTS AND DISCCUSION

The analysis of sentence production tasks and stimulated recall interviews indicates that working memory plays a decisive role in shaping sentence complexity among EFL learners. The findings show that limitations in working memory capacity directly influence learners' structural choices during language production. Sentence complexity was not determined solely by grammatical knowledge but by learners' ability to manage multiple cognitive demands simultaneously.

Across participants, simpler sentence structures dominated when cognitive load increased. During tasks that required idea development and spontaneous formulation, learners tended to produce short, linear sentences with minimal clause embedding. In the stimulated recall interviews, learners explained that they simplified sentences because holding too many elements in mind at once felt overwhelming. When attempting to produce longer or more complex sentences, they often lost track of earlier components, such as subject reference or tense consistency. As a result, simplification emerged as a strategy to reduce memory burden.

When learners attempted more complex sentences, working memory strain became evident. Participants reported difficulty maintaining conceptual content while organizing grammatical structure. Many explained that they knew how to form complex sentences but struggled to apply that knowledge in real time. For example, learners described situations where they planned to use subordinate clauses but abandoned them midway because they could not maintain the full structure mentally. This indicates a gap between declarative grammatical knowledge and procedural ability under cognitive pressure.

Lexical retrieval also interacted with working memory constraints. Learners reported that searching for appropriate vocabulary consumed significant cognitive resources, leaving fewer resources available for syntactic organization. In several cases, participants chose simpler sentence structures to accommodate lexical uncertainty. They preferred producing a complete but simple sentence rather than risking breakdown

in a complex one. This finding suggests that working memory functions as a shared resource across lexical and syntactic processes.

In writing tasks, learners demonstrated slightly higher sentence complexity than in speaking tasks, yet working memory limitations remained visible. Participants explained that although writing allowed more time, they still struggled to manage long sentences, especially when revising. Revising complex sentences required learners to reread and mentally reorganize multiple clauses, which increased cognitive load. Some participants chose to split complex sentences into shorter ones during revision to maintain clarity and control.

Learners also showed awareness of their working memory limitations. Many explicitly stated that they avoided complex sentences because they felt "mentally heavy" or difficult to control. This awareness influenced their strategic choices. Learners prioritized sentence completion and meaning clarity over structural sophistication. However, they often perceived this strategy negatively, believing that simpler sentences reflected lower proficiency, even when those sentences successfully conveyed meaning.

1. Working Memory as a Constraint on Syntactic Complexity

The findings confirm that working memory functions as a central constraint on sentence complexity in EFL learners' language production. This supports psycholinguistic theories that view sentence formation as a resource-limited process. Producing complex sentences requires learners to hold multiple linguistic units in working memory while organizing hierarchical structures. For EFL learners, whose grammatical knowledge is not fully automatized, this demand is particularly high.

The tendency to simplify sentence structure under cognitive pressure aligns with models of limited capacity processing. When working memory resources are insufficient, learners reduce structural complexity to preserve coherence and completeness. This behavior should not be interpreted as lack of competence. Instead, it reflects adaptive cognitive regulation. Learners strategically adjust sentence complexity to match available cognitive resources.

This finding challenges traditional pedagogical assumptions that equate sentence complexity directly with proficiency. Learners may possess the knowledge required for complex structures but lack the working memory capacity to apply it in real time. Sentence simplicity, therefore, may signal cognitive efficiency rather than linguistic deficiency.

2. Interaction Between Lexical Access and Working Memory

The study also reveals a strong interaction between lexical retrieval and working memory. Lexical search consumed substantial cognitive resources, limiting learners' ability to construct complex syntax. This finding supports the view that working memory operates as a shared pool across linguistic subsystems. When lexical demands increase, fewer resources remain available for syntactic planning.

This interaction explains why learners often avoid complex structures when uncertain about vocabulary. The decision to simplify syntax allows learners to allocate cognitive resources toward lexical accuracy. This strategy prioritizes meaning preservation over structural sophistication. From a psycholinguistic perspective, this reflects rational resource allocation rather than communicative weakness.

These findings suggest that sentence complexity cannot be taught or assessed independently of vocabulary processing. Instruction that pushes learners to produce complex sentences without supporting lexical access may increase cognitive overload. Effective pedagogy should consider how lexical and syntactic demands jointly tax working memory.

3. Rethinking Sentence Complexity in EFL Pedagogy

The findings have important pedagogical implications. In many EFL contexts, learners are encouraged to produce complex sentences as markers of advanced proficiency. However, this study shows that working memory limitations may prevent learners from doing so consistently. Expecting sustained complexity without cognitive support may lead to frustration, avoidance, or formulaic language use.

Teachers should recognize that sentence complexity develops gradually as working memory efficiency improves. Tasks that overload learners cognitively may reduce, rather than enhance, syntactic development. Allowing planning time, breaking tasks into stages, and scaffolding complex structures can help learners manage working memory demands. From an assessment perspective, sentence complexity should be interpreted cautiously. Simple sentences may reflect strategic control and communicative effectiveness rather than limited ability. A more balanced view of proficiency should account for cognitive constraints and task conditions.

Theoretically, this study reinforces the importance of integrating cognitive factors into second language research. Sentence complexity emerges not only from linguistic knowledge but from the interaction between knowledge and cognitive capacity. Working memory shapes what learners can produce at a given moment. Understanding this interaction leads to a more realistic and humane view of second language development.

CONCLUSION

This study explored the role of working memory in shaping sentence complexity among EFL learners from a psycholinguistic perspective. The findings show that sentence complexity is not determined solely by grammatical knowledge but is strongly influenced by learners' ability to manage cognitive demands during language production. Working memory emerged as a key factor that constrains how much structural complexity learners can handle at a given moment.

The results demonstrate that when working memory load increases, learners tend to simplify sentence structure as a strategic response. They reduce clause embedding, shorten sentences, or avoid complex constructions to maintain control over meaning and accuracy. This behavior reflects adaptive cognitive management rather than lack of linguistic competence. Learners often possess knowledge of complex structures but struggle to apply it in real time due to limited cognitive resources. Sentence simplicity therefore signals cognitive efficiency under pressure, not linguistic weakness.

The study also highlights the interaction between lexical processing and syntactic complexity. Lexical search consumes substantial working memory resources, leaving fewer resources available for syntactic planning. As a result, learners often trade structural complexity for lexical accuracy. This finding reinforces the view that language production relies on shared cognitive resources and that working memory must be considered when examining syntactic performance. From a theoretical perspective, the study supports resource-limited models of language production and extends them to EFL contexts by showing how working memory shapes structural outcomes. Sentence complexity should be understood as the product of interaction between linguistic knowledge and cognitive capacity. Ignoring this interaction leads to incomplete explanations of learner performance.

Pedagogically, the findings suggest that instruction and assessment should account for cognitive constraints. Teachers should provide planning time, scaffold complex structures, and avoid equating proficiency solely with sentence complexity. Recognizing the role of working memory can reduce unrealistic expectations and support more effective language development.

This study is limited by its small sample size and qualitative scope. Future research may examine working memory and sentence complexity across proficiency levels, task types, or longitudinal development. Overall, understanding working memory offers a more realistic and humane perspective on how EFL learners construct sentences and develop complexity over time.

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