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| RESEARCH ARTICLE

Embodied Pedagogy in the EFL Classroom: The Impact of Gesture Use on Grammar Learning and Metacognitive Awareness

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| ABSTRACT
Despite growing evidence supporting embodied approaches to language learning, little is known about how gesture-enhanced instruction influences EFL learners' grammar mastery and metacognitive awareness. Grounded in Vygotsky's Sociocultural Theory (1978), this study examined the impact of gesture-supported grammar instruction on learners' grammatical performance and their metacognitive processes across planning, monitoring, evaluating, and gesture awareness. Thirty-six EFL learners participated in a pretest–posttest design, completing a grammar test and the Metacognitive Awareness Inventory (MAI) before and after a four-week intervention incorporating systematic teacher gestures. Paired-samples t-test results revealed a significant improvement in grammar performance from pretest to posttest, indicating that gesture-enhanced instruction effectively supported learners' acquisition of targeted structures. Complementary Wilcoxon Signed-Rank Tests showed significant gains in key MAI subscales, demonstrating that gestures facilitated metacognitive development by helping learners externalize understanding, engage in self-regulation, and recognize gesture as a meaningful cognitive tool. These findings suggest that gesture-enhanced instruction not only improved linguistic outcomes but also promoted learners' ability to reflect on and regulate their grammar learning processes.

| KEYWORDS

Gesture-enhanced instruction; EFL grammar learning; Metacognitive awareness; Embodied cognition; Learner autonomy

| ARTICLE INFORMATION

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1. Introduction

In the field of second language acquisition (SLA), developing learners' metacognitive awareness is essential for promoting autonomous and effective language use. Particularly in grammar learning, students often struggle not due to lack of exposure, but because they lack strategies for consciously planning, monitoring, and evaluating their language use (Wenden, 1998; Jaleel & Premachandran, 2016). While explicit grammar instruction remains common in many English as a Foreign Language (EFL) settings, it often fails to fully engage learners cognitively and metacognitively.

Recent research grounded in embodied cognition and dual coding theory suggests that integrating intentional, teacher-led gestures into grammar instruction can significantly facilitate deeper cognitive engagement with language input among university EFL learners (Barsalou, 2008; Paivio, 1990; Hostetter & Alibali, 2008; McCafferty, 2004; Lazaraton, 2004; Sueyoshi & Hardison, 2005). Through gesture-enhanced instruction, learners may not only

grasp grammatical rules more clearly but also become more aware of how they process and regulate their understanding which are key dimensions of metacognition (Schraw & Dennison, 1994).

1.1 Purpose of the study

Although much of the previous research on gesture and language learning focused on lexical explanation, there is a succinct body of knowledge examining the use of gesture in teaching different aspects of grammar, and its potential influence on learners' metacognitive awareness, particularly in EFL university classrooms. This study seeks to fill that gap by investigating how gesture-supported grammar instruction may influence EFL learners' ability to consciously manage and reflect on their grammar learning. Specifically, this research explores whether the synchronous use of speech and gesture in grammar focused lessons help students to perform better after the intervention and become more consciously aware of their cognitive strategies such as planning, error checking, and self-monitoring. In doing so, this study aims to contribute to a deeper understanding of how embodied teaching techniques can serve as metacognitive scaffolds within the EFL grammar classroom.

By addressing this underexplored connection, the study seeks to contribute both theoretically and pedagogically: it extends gesture research into the domain of grammar instruction and introduces gesture as a potential metacognitive trigger, providing a novel, embodied dimension to language strategy training.

1.2 Research Questions

The study specifically addresses the following research questions:

1. To what extent does gesture-enhanced instruction affect EFL learners' grammar performance?
2. How does gesture-enhanced grammar instruction influence learners' metacognitive awareness of their grammar learning?

2. Literature Review

2.1 Conceptual Framework

2.1.1 Metacognitive Awareness

Metacognition is defined as the ablity to be aware of your own thinking process, and the strategies one is using to achieve learning (Schraw & Dennison, 1994; Sajna Jaleel, Premachandran. P, 2016). In the context of second language learning, developing metacognitive awareness enables learners to actively plan, monitor, and evaluate their understanding and use of linguistic forms. Metacognition is typically broken down into two main components: metacognitive knowledge (what learners know about their cognition and learning strategies) and metacognitive regulation (how learners plan, monitor, and evaluate their learning) (Wenden, 1998).

Developing metacognitive awareness is especially important in second language acquisition because it enables learners to become more autonomous and strategic. Rather than relying solely on rote memorization or passive exposure, metacognitively aware learners are better equipped to set goals, assess their progress, and adapt their learning strategies accordingly (Veenman, Van Hout-Wolters, & Afflerbach, 2006). In grammar learning specifically, these skills may help learners notice form-function relationships, check for accuracy, and revise incorrect patterns over time (Anderson, 2002).

Research has shown that promoting metacognitive skills in the classroom can lead to improved language outcomes, especially when learners are encouraged to reflect on their thinking through guided instruction or strategy training (Zhang & Goh, 2006). However, grammar instruction often remains focused on form and rule memorization, with limited opportunities for learners to actively reflect on how they approach grammar learning. This gap calls for more instructional methods that can support both cognitive and metacognitive development in tandem.

2.1.2 Gestures in Language Learning

Kendon (2004) describes gesture as "a name for visible action when it is used as an utterance or as a part of an utterance," while an utterance is "any ensemble of actions that counts for others as an attempt by the actor to 'give' information of some sort" (p. 7). The core of body language is gesture. Gestures are hand movements that are

closely related to speech, illustrating or supplementing it in a broad sense; in the simplest form, gestures are hand movements that are closely related to speech, illustrating or complementing it.

In language learning settings, gestures are typically categorized as iconic, metaphoric, deictic, or beat gestures (McNeill, 2005). Iconic gestures visually represent the content of speech, such as miming a rising action to show an increase, while metaphoric gestures convey abstract concepts like shaping the air to represent grammatical structure. These types of gestures can help learners grasp intangible or unfamiliar language forms by connecting them with visual-spatial representations.

Gestures serve as physical representations of abstract grammar structures, helping learners visualize and internalize complex rules through embodied interaction. synchronizing verbal explanations with meaningful gestures provide students with dual channels of input, facilitating deeper processing and retention. Beyond aiding comprehension, gestures also function as metacognitive cues that externalize thinking processes (Goldin-Meadow, 2000, McNeill, 1992). When learners observe or imitate such gestures, they become more aware of how they process, apply, and monitor grammatical forms (Tomasello, 1999 McCafferty 2002, Zhao 2007). This heightened awareness promotes strategic learning behaviors such as planning, self-monitoring, and error evaluation (Mari, Tsalas, & Paulus, 2023).

2.2 Theoritical Framework

2.2.1 Vygotsky's Sociocultural Theory

This study draws on sociocultural theory to understand how gestures function as mediational tools in socially situated grammar instruction, on embodied cognition to explain how those gestures enhance cognitive processing through sensorimotor engagement, and on metacognitive theory to explore how learners' awareness of gesture use may foster strategic regulation of their grammar learning. According to Vygotsky (1978), the human mind is mediated. This suggests that people do not form a direct relation with words but rather it is mediated through the use of tools and signs which in turn are used to mediate relationships with others. Therefore, mental development is subjected to the tools humans create and the social relationships they form with others. Gestures are considered one of the tools involved in this mediation and foreign language learning in the current research. In language learning contexts, these mediational tools help learners move from simple participation in communicative acts to more complex understanding and internalization of linguistic forms. Gestures, in particular, serve as visual and kinesthetic tools that can scaffold abstract grammatical concepts and support learners' meaning-making processes during instruction (McCafferty, 2002, 2004). When used intentionally by teachers, gestures can provide conceptual grounding for learners, especially in situations where verbal explanations alone may not suffice.

If we consider social interactions as the foundation of social life, then intersubjectivity becomes a fundamental concept for the social sciences overall and for understanding social behavior in particular. At its simplest, intersubjectivity has been used to denote consensus, where individuals share a common understanding of an object or concept (J. Mori & Hayashi, 2006).

One key contribution of gestures to intersubjectivity lies in their ability to provide a visual representation of abstract concepts. Language, particularly when encountered for the first time, can be filled with intangible ideas like grammatical structures. Gestures, however, can offer a concrete counterpart to these abstractions (McNeill, 2000).

According to Cassell et al., (1999), gestures can also effectively direct student attention and guide their focus toward crucial aspects of the language being taught. By using gestures strategically, teachers can highlight specific words, phrases, or grammatical structures within a sentence. This targeted use of gestures helps students filter out extraneous information concentrate on the key elements necessary for language acquisition and ensure intersubjectivity between students.

Researchers have focused primarily on gestures and their function in grammar learning (Gullberg & McCafferty, 2008; Hudson, 2011; Nakatsukasa, 2016; Rosborough, 2011; Smotrova, 2014; van Compernolle & Smotrova, 2017). McNeill's (1992) seminal work positioned gestures as integral to thought and language, introducing the idea that gestures and speech form a unified cognitive system. The sociocultural turn, influenced by Vygotsky (1978) theories, further emphasized gestures as cultural and semiotic tools that mediate learning and social interaction. Meanwhile,

advancements in neuroscience and embodied cognition theories provided empirical support for the interconnectedness of gestures, language, and brain function.

2.2.2 Embodied Cognition

Embodied cognition theories suggest that learning is not purely a mental process but is grounded in bodily experiences (Wilson, 2002; Hostetter & Alibali, 2008). In this view, gestures play a crucial role in making language input more concrete and meaningful. Studies have shown that learners who are exposed to gestures alongside verbal explanations tend to retain vocabulary and grammar rules more effectively than those who receive speech-only instruction (Tellier, 2008; Sueyoshi & Hardison, 2005). This dual-channel input—verbal and visual—facilitates deeper processing and improves comprehension, especially when dealing with complex or abstract content like grammatical rules.

Furthermore, gestures are not just helpful for comprehension, they also support learners' internal processing. Research found that second language learners use gestures not only to communicate but also to mediate their own thinking, particularly when their verbal skills are still developing (McCafferty, 2004; Lantolf, 2010; van Compernolle & Williams, 2011). In other words, gestures have dual functions interpersonal function interpersonal (social, communicative) and intrapersonal tools, helping learners organize thoughts, rehearse forms, or work through problems often before they're ready to express them in the target language (McNeill 2005).

Metacognitive theory centers on learners' ability to understand, control, and regulate their own learning processes (Flavell 1979). In the context of language learning, metacognition plays a crucial role, particularly in grammar acquisition, which often requires deliberate attention, hypothesis testing, and error analysis. Learners who are metacognitively aware are more likely to recognize when they do not understand a grammatical rule, choose strategies to address the gap, and assess the success of those strategies (Anderson, 2002).

Recent research highlights that metacognitive awareness can be enhanced not only through verbal reflection, but also through embodied cues such as gesture (Alibali et al., 2013; Mari et al., 2023). Within this framework, gesture can be seen as a scaffold that supports these regulatory processes. Research suggests that gestures can cue learners to focus attention, reflect on conceptual structure, and recall previously learned rules (Goldin-Meadow, 2003; Alibali et al., 2013). When used intentionally during grammar instruction, teacher-led gestures may act as external aids that help students plan responses, monitor rule application, and notice discrepancies helping them identify effective strategies or recognize breakdowns in comprehension (Goldin-Meadow, 2003; Tellier, 2008).

This aligns with findings by Mari et al. (2023), who suggest that learners interpret gestures not only as communicative acts but also as metacognitive signals. In this view, gesture is not merely an accessory to speech but a tool for prompting awareness, reflection, and correction all of which are critical to the development of grammatical accuracy in a second language. Thus, metacognitive theory provides a foundation for understanding how gesture-enhanced instruction might not only improve grammatical knowledge, but also promote strategic, self-regulated learning behaviors.

3. Research Methodology

3.1 Research Design

This study employs a pre-experimental one-group pre-test post-test design, to investigate the effects of gesture-supported grammar instruction on EFL learners' grammar performance and metacognitive awareness. This design is appropriate when random assignment or control groups are not feasible (Creswell, 2018), yet it permits the examination of changes over time by comparing pre- and post-intervention data within the same group. The intervention consists of grammar lessons that integrate synchronized gestures and speech, enabling a focused analysis of how such instruction influences learners' outcomes across the intervention period.

Over a 5-week period, participants received grammar instruction that integrates intentional, teacher-led gestures synchronized with verbal explanations. Gestures were designed to visually represent specific grammatical forms and functions (e.g., tense shifts, conditional structures). These gestures were systematically embedded into lessons to

function as cognitive and metacognitive cues, helping students internalize grammatical structures and regulate their own understanding.

In addition to the grammar pre- and post-tests, an adapted metacognitive awareness questionnaire was administered both before and after the instructional intervention. The questionnaire is based on Schraw and Dennison's (1994) Metacognitive Awareness Inventory (MAI), and has been modified to align with the specific context of grammar instruction in an EFL setting. Several items were reworded or added to reflect learners' strategic awareness of grammar learning, with particular attention to the role of gesture as a mediating tool. The instrument aims to capture participants' awareness of their planning, monitoring, and regulation strategies, including how they perceive and utilize gesture as part of their learning process.

3.2 Participants

The sample included **35 university EFL students** enrolled in an intermediate-level grammar course at UEMF. The researcher is also the course instructor. All students were informed of the study's purpose, and participation was voluntary. Informed consent was obtained, and anonymity was maintained in data reporting.

3.3 Instruments

This study employs two main instruments: a grammar test and an adapted metacognitive awareness questionnaire. The grammar test, administered both before and after the intervention, is designed to assess learners' understanding of specific grammar structures taught during the instructional period. It includes multiple-choice, fill-in-the-blank, and error correction items aligned with the course syllabus. The second instrument is an adapted version of the Metacognitive Awareness Inventory (MAI) developed by Schraw and Dennison (1994), revised to suit the context of EFL grammar instruction. Additional items were included to reflect learners' awareness of gesture as a cognitive and metacognitive tool. This questionnaire, administered both pre- and post-intervention, aims to capture participants' use of planning, monitoring, and regulation strategies in grammar learning, with specific attention to the role of gesture in supporting these strategies.

3.4 Data analysis

The research objective sought to examine whether gesture-supported grammar instruction enhances university EFL learners' metacognitive awareness and grammar performance. To address this objective, quantitative data from both the grammar pre- and post-tests and the metacognitive awareness questionnaires, administered before and after the intervention, will be analyzed using SPSS version 25. This approach enables a comprehensive examination of learning gains and strategy shifts while ensuring reliability and validity of the findings. Descriptive statistics (means, standard deviations) will be used to summarize participants' awareness levels. To determine the effectiveness of the intervention, paired-sample t-tests will be conducted to compare pre- and post-intervention scores in both grammar knowledge and metacognitive awareness.

4. Results

4.1 Reliability Analysis of MAI Subscales

Reliability analysis was conducted for the adapted Metacognitive Awareness Inventory (MAI) to ensure that the subscales provided consistent and dependable measurements

Table 1. Reliability analysis of the MAI questionnaire

Subscale	No. of Items	α Pre	α Post
Planning Strategies	4	.936	.809
Monitoring Strategies	4	.711	.867
Evaluating Strategies	3	.823	.903
Gesture Awareness	5	.847	.910

As shown in Table 1, Cronbach's alpha values for the four subscales ranged from .711 to .936 in the pretest and from .809 to .910 in the posttest. These results demonstrate acceptable to excellent internal consistency (Nunnally & Bernstein, 1994). Notably, reliability improved for most subscales following the intervention, particularly for Monitoring Strategies (α = .711 to .867) and Evaluating Strategies (α = .823 to .903). The Gesture Awareness subscale also showed strong reliability in both phases (α = .847 pre; α = .910 post). These findings indicate that the adapted MAI is a reliable instrument for assessing EFL learners' metacognitive awareness in grammar learning with gesture-supported instruction.

4.2 Descriptive statistics of grammar performance and MAI subscales

Descriptive statistics indicated notable improvements from pre- to post-test across all measures. Table 2 presents a comprehensive overview of the means and standard deviations for grammar performance and the metacognitive subscales.

Table 2. Descriptive Statistics for Grammar and Metacognitive Subscales

Measure	Pre-test M (SD)	Post-test M (SD)	Skew Pre	Skew Post	Kurtosis Pre	Kurtosis Post
Grammar Performance	10.90 (3.05)	13.98 (2.81)	-0.18	-0.32	0.05	-0.16
Planning Strategies	2.88 (0.86)	3.88 (0.63)	0.35	-0.72	-1.67	1.58
Monitoring Strategies	3.98 (0.18)	4.28 (0.72)	-4.50	-0.70	24.95	-0.34
Evaluating Strategies	3.73 (0.43)	4.31 (0.57)	-1.67	-0.04	2.19	-1.15
Gesture Awareness	2.49 (0.39)	4.31 (0.43)	-0.28	-0.05	-0.71	1.53

Learners' grammar performance increased from a pre-test mean of 10.90 (SD = 3.05) to a post-test mean of 13.98 (SD = 2.81). Parallel gains were observed across metacognitive subscales: Planning Strategies (Pre: M = 2.88, SD = 0.86; Post: M = 3.88, SD = 0.63), Monitoring Strategies (Pre: M = 3.98, SD = 0.18; Post: M = 4.28, SD = 0.72), Evaluating Strategies (Pre: M = 3.73, SD = 0.43; Post: M = 4.31, SD = 0.57). Gesture awareness markedly increased, with means rising from 2.49 (SD = 0.39) to 4.31 (SD = 0.43). Skewness and kurtosis values suggested that distributions were generally within acceptable limits, justifying the use of parametric analyses for subsequent inferential tests. Thus, these findings indicate improvements across all measured constructs following the intervention.

4.3 Normality Assessment of Grammar and Metacognitive Scores

Normality of the data was assessed using both the Kolmogorov–Smirnov and Shapiro–Wilk tests (see Table 2) to determine whether the distributions of scores met the assumptions required for parametric analyses.

Table 3. Normality Tests of Pre-post Intervention scores

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Grammer Pretest	,070	36	,200	,980	36	,731
Grammar Posttest	,114	36	,200	,980	36	,757
Planning Strategies (Pre)	,239	36	.000	.807	36	.000
Planning Strategies (post)	.167	36	.012	.935	36	.035
Monitoring Strategies (pre)	,490	36	.000	.344	36	.000
Monitoring Strategies (post)	,204	36	.001	.871	36	.001
Evaluating Strategies (pre)	,346	36	.000	.676	36	.000
Evaluating Strategies (post)	,231	36	.000	.841	36	.000
Gesture Awareness (pre)	,151	36	.038	.937	36	.042
Gesture Awareness (post)	,270	36	000	.817	36	.000

a. Lilliefors Significance Correction

Results indicated that grammar scores met the assumption of normality in both the pretest, K(36) = .070, p = .200; W(36) = .980, p = .731, and the posttest, K(36) = .114, p = .200; W(36) = .980, p = .757. In contrast, most of the metacognitive subscales including Planning, Monitoring, Evaluating, and Gesture Awareness deviated significantly from normality in at least one of the tests ($p < .05$). Because the grammar measures satisfied the normality assumption, parametric tests (i.e., paired-sample t-tests) were deemed appropriate for analyzing pre- and post-test grammar scores. However, given that the metacognitive subscale scores violated the normality assumption, nonparametric alternatives were employed. Specifically, Wilcoxon signed-rank tests were used to compare pre- and post-intervention scores for Planning, Monitoring, Evaluating, and Gesture Awareness. This approach ensures that the analyses were statistically appropriate given the distributional properties of each measure.

4.4 Paired-Samples t-Test for Grammar Performance

As shown in table, a paired-samples t-test was conducted to compare grammar performance before and after the gesture-supported instruction. This test was chosen because the grammar scores met the assumption of normality, allowing for parametric analysis, and because it is appropriate for comparing two related means from the same participants.

Table 4. Paired-Samples t-Test for Grammar Performance Pre- and Post-Intervention

	M	SD	Mean Difference	95% Confidence Interval of the Difference		t(35)	p	Cohen's d
				Lower	Upper			
Pair 1 Grammar Pretest	10.90	3.05						
			3.08	-7,16301	-5,57383	-11.12	<.001	1.85
Grammar Posttest	13.98	2.81						

Results revealed a statistically significant improvement from the pretest (M = 10.90, SD = 3.05) to the posttest (M = 13.98, SD = 2.81), t(35) = -11.12, p < .001, with a large effect size (Cohen's d = 1.85). These findings provide strong evidence that the gesture-supported intervention was effective in enhancing grammar performance among the participants.

4.5 Wilcoxon Signed-Rank Tests for Metacognitive Subscales

A series of Wilcoxon signed-rank tests was conducted to examine changes in planning, monitoring, evaluating, and gesture awareness scores from pre- to post-intervention. These nonparametric tests were selected because the

metacognitive subscale scores violated the assumption of normality, making parametric tests (e.g., paired-samples t-tests) inappropriate (see table 5).

Table 5. Wilcoxon Signed-Rank Test for Pre- and Post-Intervention Metacognitive Scores

	Z	p (2-tailed)	Median Pre	Median Post	Direction	r
Planning	-3.955	.000	2.5000	4.0000	Increase	0.659
Monitoring	-2.249	.024	4.0000	4.3750	Increase	0.375
Evaluating	-4.163	.000	4.0000	4.0000	Increase	0.694
Gesture Awareness	-5.169	.000	2.5000	4.2000	Increase	0.861

Results indicated a significant increase in planning scores, $Z = -3.955$, $p < .001$, with the median score rising from 2.5000 to 4.0000, and a large effect size, $r = 0.659$, suggesting that participants' planning abilities improved substantially following the intervention. Similarly, monitoring scores significantly increased, $Z = -2.249$, $p = .024$, with the median increasing from 4.0000 to 4.3750, and a medium effect size, $r = 0.375$. Evaluating scores also showed a significant improvement, $Z = -4.163$, $p < .001$; although the median remained 4.0000, the distribution shifted toward higher scores, with a large effect size, $r = 0.694$. Finally, gesture awareness scores significantly increased, $Z = -5.169$, $p < .001$, with the median rising from 2.5000 to 4.2000, and a very large effect size, $r = 0.861$. These results suggest that the intervention had a robust and statistically significant positive impact across all four measured domains, with effect sizes ranging from medium to very large.

5. Discussion

The present study investigated the impact of gesture-enhanced instruction on EFL learners' grammar performance and their metacognitive awareness of grammar learning. The findings provide robust evidence that integrating gestures into grammar teaching can significantly improve both learners' grammatical competence and their awareness of the strategies they employ during learning.

The findings of this study revealed that gesture-enhanced instruction significantly improved both grammar performance and metacognitive awareness among EFL learners. The paired-samples t-test indicated a robust gain in grammar scores from pretest to posttest, supporting the effectiveness of gesture-supported instruction in facilitating learners' grasp of grammatical structures. Similarly, improvements across the MAI subscales (Planning, Monitoring, Evaluating, and Gesture Awareness) suggest that learners not only benefited linguistically but also became more aware of how they approach, regulate, and reflect on their grammar learning.

One explanation for these results lies in the teacher's deliberate use of gestures as visual affordances to scaffold students' understanding, facilitating their ability to discern grammatical structures. Sikveland and Ogden (2012) suggest that gestures often serve an intersubjective role in promoting mutual understanding, and this appeared evident in the classroom interaction. By pairing grammar input with intentional gestures, the teacher provided learners with additional semiotic resources that reduced cognitive load and clarified otherwise abstract forms.

This approach capitalizes on embodied cognition, providing students with multisensory learning experiences that lead to richer memory traces and better retention of grammatical knowledge (Goldin-Meadow, 2010). The teachers' deliberate use of gestures in the classroom exemplifies this dynamic interplay between internalization and externalization in EFL learning. Through gestures, semantic content is enacted, serving as a mediational tool for students to construct meaning visually. Conversely, externalization occurs when students move from an internal, cognitive understanding to an external expression, such as through speech or gesture.

The results of the Wilcoxon Signed-Rank Tests further demonstrated significant changes across multiple dimensions of metacognitive awareness, including planning, monitoring, evaluating, and gesture awareness. These findings

suggest that gesture-enhanced instruction not only improved linguistic outcomes but also promoted learners' ability to reflect on and regulate their grammar learning processes. This supports Flavell's (1979) conceptualization of metacognition as the awareness and control of one's cognitive activities, as well as highlighting the role of strategic awareness in language learning (Veenman, Van Hout-Wolters, & Afflerbach, 2006).

In particular, the increase in gesture awareness underscores that learners became more attuned to the pedagogical role of gestures in facilitating grammar learning. By observing and potentially reproducing the teacher's gestures, learners may have developed strategies for encoding and retrieving grammatical knowledge. This resonates with studies by Tellier (2008) and Sueyoshi and Hardison (2005), who showed that gestures support deeper levels of engagement with language input.

Importantly, the Wilcoxon results indicate that gesture-enhanced instruction also fostered metacognitive development by externalizing their understanding through gesture, students afforded the teacher opportunities to observe embodied thought processes and to provide targeted support, thereby promoting self-regulation. The Gesture Awareness subscale in particular suggests that learners began to treat gesture not merely as accompaniment but as an embodied cognitive tool to confirm understanding. In line with Tellier (2008), gestural mimicry and student adaptation of teacher gestures appear to function microgenetically: students created, adapted, and personalized gestures, engaging motor modalities that generate richer memory traces and improved recall.

In addition, gestures served as an embodied cognitive tool to confirm students' understanding, highlighting the role of gestures in the microgenetic development of language learning. In the context of gestural thinking, students not only created their own interpretations but also adapted and reinterpreted the teacher's gestures, thereby transforming them into personalized expressions. This process engages their motor modality, appraising their grasp of grammar concepts, making abstract understandings visible and open to reflection. (Matsumoto 2017; Platt & Brooks 2008; ;van Compernolle & Williams 2011).

6. Conclusion

The present study investigated the impact of gesture-enhanced instruction on EFL learners' grammar performance and metacognitive awareness. Results from the paired-samples t-test revealed that gesture support significantly improved learners' grammar scores, demonstrating that embodied input can effectively scaffold the acquisition of complex linguistic structures. Complementing these findings, the Wilcoxon Signed-Rank Tests showed significant gains across multiple dimensions of metacognitive awareness, including planning, monitoring, evaluating, and gesture awareness. Together, these results indicate that gestures do not simply serve as supplementary cues but function as powerful cognitive and metacognitive tools that enrich learners' engagement with language.

Theoretically, this study adds to the growing body of evidence supporting embodied cognition, highlighting how gestures bridge abstract linguistic concepts and tangible, visible actions. Practically, the findings suggest that EFL teachers can enhance both grammar mastery and metacognitive growth by integrating purposeful gestures into instruction. Gestures allow learners to externalize internal processes, enabling both self-regulation and opportunities for teachers to provide targeted scaffolding.

Pedagogically, these findings support integrating deliberate, synchronized gestures into grammar instruction. Gestures operated as both a linguistic scaffold making form and meaning more salient and a metacognitive catalyst helping learners plan, monitor, and evaluate their grammar learning. For instructors, this suggests designing lessons where intentional, consistent gestures accompany target grammar points and where students are encouraged to use gesture actively as a problem-solving and consolidation strategy.

6.1 Limitations and Future Directions

This study has limitations. The sample size was moderate (N = 36), and the design was a one-group pre–post (pre-experimental), which limits causal inferences and generalizability. Although the use of nonparametric tests for MAI subscales appropriately addressed distributional issues, future research should replicate these findings with larger

samples and experimental (control) groups to isolate the specific contribution of gestures from other instructional elements. Longitudinal follow-ups would also clarify whether the grammar and metacognitive gains are retained over time. Finally, exploring different gesture types (iconic, deictic, metaphoric) and their specific effects on particular grammar structures would refine pedagogical recommendations.

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