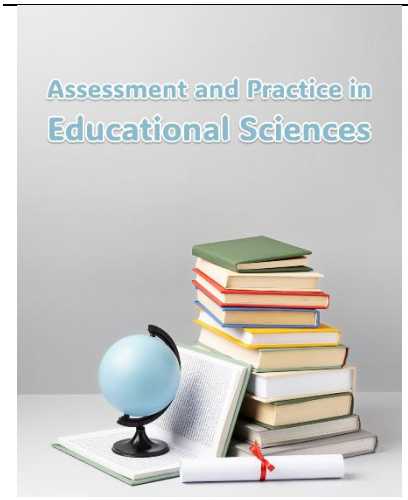
Assessment and Practice in Educational Sciences



Investigating the Impact of Corrective Feedback on Interlingual/Intralingual Grammatical Interference

ABSTRACT

This study examines the efficacy of corrective feedback (CF) types—recasts, elicitation, and metalinguistic feedback—in addressing interlingual (L1-influenced) and intralingual (L2-systemic) grammatical errors among Iranian intermediate EFL learners. Grounded in Richards' (1974) error classification, the research aims to: (1) compare CF effects across gender groups, (2) identify optimal feedback strategies for each interference type, and (3) inform pedagogical practices for error reduction. A quasi-experimental design was employed with 90 participants (60 selected via Nelson Proficiency Test, M=25, SD=9) randomly assigned to six groups (three males, three female). Each group received one CF type (recast, elicitation, or metalinguistic) during 10 instructional sessions. Data were collected through pre-/post-tests (Grammaticality Judgment Tests) and analyzed via paired samples t-tests and two-way ANOVA using SPSS 26. Inter-rater reliability was high (Cronbach's α=0.91). Recasts significantly improved accuracy ($p<0.001$) for both genders (male: pretest M=12.33→posttest M=14.03; female: M=12.19→15.05). Metalinguistic feedback showed the highest efficacy (male: M=12.20→15.06, $p<0.001$; female: M=12.32→14.03, $p<0.001$), particularly for intralingual errors. Elicitation had moderate effects (male: M=12.30→14.01; female: M=12.34→14.05), with greater impact on interlingual errors. Gender differences were negligible ($p>0.05$), suggesting universal CF applicability. Metalinguistic feedback emerged as the most effective for grammatical accuracy, likely due to its explicit rule explanation. Recasts enhanced fluency, while elicitation balanced both dimensions. The study confirms CF's critical role in mitigating L1/L2 interference, with implications for differentiated error correction strategies.

Keywords: Corrective feedback, Interlingual interference, Intralingual interference, Grammatical accuracy, EFL pedagogy

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Article type:
Original Research

Article history:
Received 17 June 2025
Revised 30 August 2025
Accepted 04 September 2025
Published online 04 September 2025

How to cite this article:
Mostofi Shalmani, B., Pourkalhor, O., & Safdari, S. (2025). Investigating the Impact of Corrective Feedback on Interlingual/Intralingual Grammatical Interference. *Assessment and Practice in Educational Sciences*, *3*(4), 1-13. https://doi.org/10.61838/japes.106

Introduction

The ability to communicate effectively in a second or foreign language depends strongly on learners' grammatical competence, which underpins their broader communicative competence and academic success (1). Grammar provides the structural foundation for meaningful expression, yet for many English as a Foreign Language (EFL) learners, acquiring grammatical accuracy remains a major challenge due to persistent errors influenced both by the first language (L1) and by incomplete internalization of second language (L2) rules (2, 3). These recurring deviations from target norms—whether caused by L1 transfer (interlingual interference) or misgeneralizations within the L2 system (intralingual interference)—have been

extensively discussed in second language acquisition (SLA) research as markers of learners' interlanguage development (4, 5). Understanding and effectively addressing these errors is essential for designing pedagogical interventions that promote accurate and fluent language use among EFL learners (6, 7).

Early studies in error analysis highlighted the central role of learners' native language in shaping their emerging interlanguage (2). Interlingual interference arises when learners transfer structural or lexical patterns from their L1 into L2 production under the assumption of cross-linguistic similarity (5). For Persian-speaking learners of English, syntactic and morphological mismatches between Persian and English—such as word order and verb tense formation—often manifest as persistent grammatical inaccuracies (8). However, research has shown that not all errors are L1-induced. Intralingual interference results from learners' overgeneralization of L2 rules, false analogies, or incomplete application of grammatical principles (9, 10). For example, learners may incorrectly extend regular past tense –ed endings to irregular verbs or misapply pluralization rules to noncount nouns (3). This dual nature of grammatical interference underscores the complexity of error sources and the need for nuanced instructional responses (1).

Error analysis theory, emerging from the seminal work of Corder and later expanded in applied linguistics, remains a vital diagnostic tool for teachers and researchers to categorize and interpret learner errors (2, 10). Contemporary EFL scholarship continues to refine these analytical frameworks to account for developmental errors, cross-linguistic influence, and learner-specific factors such as proficiency and motivation (1, 11). This diagnostic function is critical because it informs targeted pedagogical interventions aimed at breaking entrenched error patterns.

Corrective feedback (CF) is one of the most studied and debated instructional responses to learner error in SLA (4, 9). CF refers to any response that signals the presence of an error and provides the learner with information that can facilitate reformulation toward the target form (12). Over decades, CF research has evolved from general taxonomies to fine-grained classifications that consider the explicitness of feedback and the degree of learner engagement required (13). Among the most recognized CF types are recasts (teacher reformulates an incorrect utterance without overtly marking it as wrong), elicitation (teacher prompts learners to self-correct by pausing, questioning, or signaling a gap), and metalinguistic feedback (teacher provides rule-based information or clues about the nature of the error) (5, 9).

Debates persist about the relative efficacy of implicit versus explicit feedback (4, 14). Recasts, as an implicit form of CF, maintain conversational flow and reduce anxiety but risk going unnoticed by learners (15, 16). In contrast, explicit approaches such as metalinguistic feedback draw direct attention to form and rules, increasing the likelihood of uptake but potentially disrupting communication (1). Elicitation occupies a middle ground by engaging learners in hypothesis testing and self-repair while still requiring some awareness of correct forms (5). Importantly, the impact of these feedback types appears to vary across error sources. For instance, L1-based transfer errors may respond better to overt, rule-focused input, whereas intralingual errors might be addressed through guided noticing and self-correction (7, 10).

A robust body of research has explored CF in diverse instructional contexts and proficiency levels, including its effects on pronunciation (5, 15, 16), writing accuracy (3, 8, 17), and reading comprehension (18). Recent advances have also examined affective and cognitive dimensions of feedback processing. Learners' emotional responses to CF, such as anxiety or motivation, can moderate its impact on accuracy gains (1, 12). Technological innovations—such as automated feedback systems and artificial intelligence (AI) tools—have begun to complement traditional teacher-led feedback, offering scalable and personalized correction (19-21). However, despite these advances, classroom teachers remain central agents in delivering effective CF tailored to learners' needs and error profiles (7).

One emerging insight is the mismatch between teachers' beliefs about CF and their actual practices. Iranian EFL contexts reveal that instructors often express strong support for explicit feedback but in practice rely heavily on recasts or ignore certain

errors due to time constraints or classroom dynamics (7). Moreover, learners' preferences can differ from teachers' assumptions; some appreciate metalinguistic explanations, while others favor less intrusive prompts (1). Understanding these dynamics is vital for optimizing feedback strategies that balance accuracy, fluency, and learner autonomy.

Although the theoretical underpinnings of CF and error analysis are well established (3, 4, 9), gaps remain in applied classroom research—particularly regarding how specific CF types interact with error origins (interlingual vs. intralingual) among Persian-speaking EFL learners. Many previous studies have examined CF's effect on overall accuracy but have not systematically differentiated between error types (5, 10). Others have focused on written errors (8, 17) or specialized domains such as tone acquisition or pronunciation (14, 15), leaving a relative paucity of research on spoken grammatical interference in mainstream EFL classrooms. In addition, the influence of learner variables such as gender and proficiency on the uptake of feedback remains underexplored in many contexts (1, 18).

Another gap concerns the practical alignment of CF with communicative language teaching. While some teachers hesitate to provide explicit corrections fearing they may inhibit fluency or motivation, evidence suggests that well-timed, form-focused feedback can coexist with communicative practice (4, 22). Developing empirically validated guidelines for balancing accuracy and communication is especially urgent in contexts where English serves both academic and professional functions, such as Iran's expanding internationalization of higher education and professional sectors (1, 7).

A promising frontier is the integration of emerging AI-based tools with human-delivered feedback (19, 20). Automated systems can detect and categorize learner errors at scale, providing immediate recasts or metalinguistic hints, while teachers can use this data to inform targeted instruction. Research in mathematics and other content areas shows that AI-enhanced feedback can improve uptake and personalization (21), but its full potential in EFL grammar teaching remains underexplored. Hybrid models could help overcome teachers' time constraints and ensure that learners receive frequent and high-quality CF tailored to their specific error types (1).

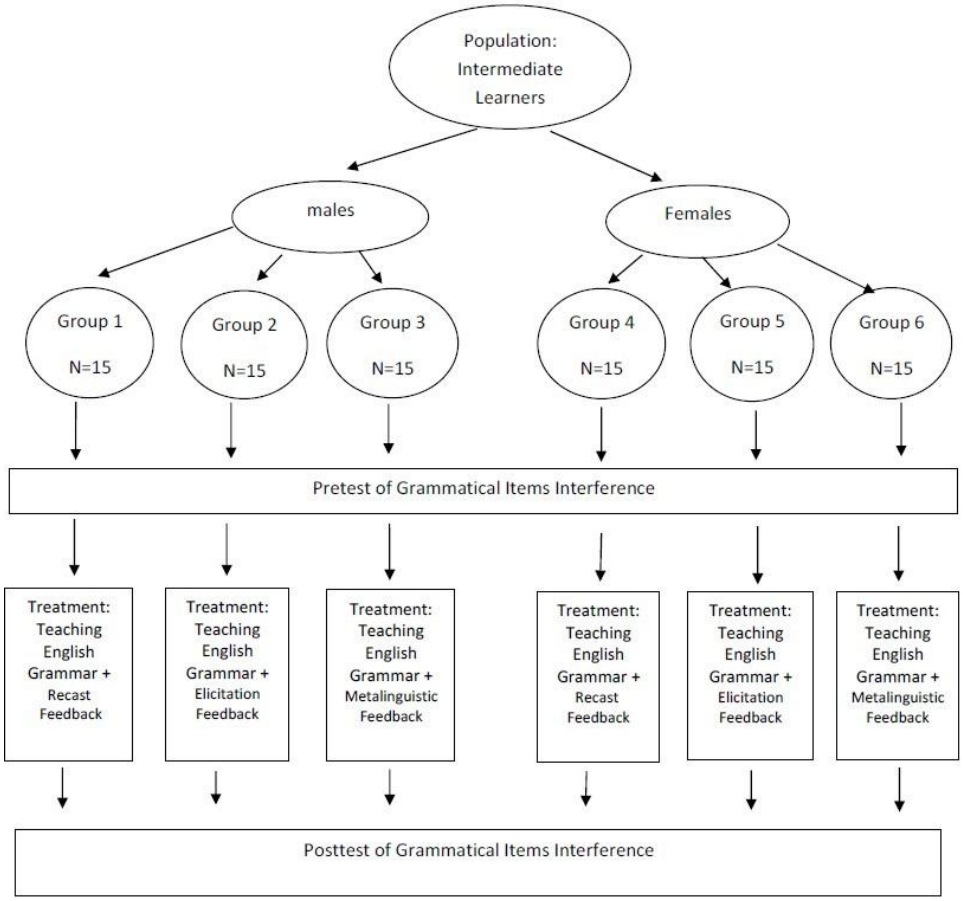
However, technology should not be seen as a replacement for the teacher's pedagogical judgment. The nuanced decision-making involved in choosing when and how to correct an error—taking into account the learner's emotional state, task complexity, and communicative goals—still requires human expertise (7). Future CF frameworks should consider how to harmonize automated support with teacher mediation, enabling personalized but socially responsive feedback ecosystems.

Against this backdrop, there is a clear need for empirical work that examines how different types of corrective feedback—particularly recasts, elicitation, and metalinguistic feedback—affect distinct error categories (interlingual and intralingual interference) among Iranian intermediate EFL learners. Prior studies have typically aggregated errors or have not compared feedback types under controlled instructional conditions (5, 10). Moreover, the Persian EFL context provides a rich site for exploring these dynamics, as learners' interlanguage development is shaped by unique L1–L2 contrasts and by local teaching practices (7, 8). By systematically contrasting feedback types across error categories, instructors can refine their strategies and address persistent grammatical inaccuracies more effectively. Therefore, the present study aims to investigate the comparative effectiveness of recast, elicitation, and metalinguistic corrective feedback in reducing interlingual and intralingual grammatical interference among Iranian intermediate EFL learners, providing evidence-based insights for optimizing error correction practices.

Methods and Materials

This study used a quasi-experimental design. In this way, the study involved the use of pre- and post-tests, randomization of participants into two experimental groups, but lacked a control group. Quasi-experimental studies "are a subtype of non-experiments that attempt to mimic randomized, true experiments in rigor… and do not require a true control group but may

include a comparison group. A comparison group is an additional experimental group that receives a different experimental treatment".



Richards (1974) classified errors, according to their causes, into two categories. The two categories are as follows:

1. Interlingual errors: these errors are caused by mother tongue interference.

2. Intralingual and developmental errors: this kind of error occurs during the learning process of the second language at a stage when the learners have not acquired the knowledge.

In addition, errors are also caused by the

1. Interlingual errors (Mother-tongue influence): these kinds of errors are influenced by the native languages which interfere with target language learning, difficulty, or the problem of language itself.

2. Intralingual errors: these types of errors are caused by the target language itself like false analogy, misanalysis (learners form a wrong hypothesis), incomplete rule application (this is the converse of overgeneralization or one might call it undergeneralization as the learners do not use all the rules), Exploiting redundancy (this error occurs by carrying considerable redundancy. This is shown throughout the system in the form of unnecessary morphology and double signaling), Overlooking co-occurrence restrictions (this error is caused by overlooking the exceptional rules), Hypercorrection or monitor overuse (these results from the learners over cautious and strict observance of the rules), Overgeneralization or system-simplification (this error is caused by the misuse of words or grammatical rules).

Recast: in second language acquisition, a type of negative feedback in which a more competent interlocutor (parent, teacher, native-speaking interlocutor) rephrases an incorrect or incomplete learner utterance by changing one or more sentence

components (e.g. subject, verb, or object) while still referring to its central meaning.Recasts have the following characteristics: a. they are a reformulation of the ill formed utterance. b. they expand the utterance in some way. c. the central meaning of the utterance is retained d. the recast follows the ill-formed utterance.

Data collection for this study involved a combination of fieldwork, library research, interviews, note-taking, and the use of a Grammaticality Judgment Test. Additionally, a general proficiency assessment using the Oxford Placement Test (OPT) was administered to create a homogeneous sample before conducting the main experiment. The data from these tests were analyzed using the Statistical Package for the Social Sciences (SPSS) software. The statistical population comprised 100 intermediate language learners from Lahijan English Institutes, and a cluster random sampling method was employed, resulting in a sample size of 90 students distributed across six groups.For the analysis of the collected data, several statistical methods were utilized. These included Independent Samples T-tests, Paired Samples T-tests, and Two-Way ANOVA. Specifically, hypotheses were tested using a combination of Independent Samples T-tests and Paired Samples T-tests to evaluate different aspects of the data, ensuring a comprehensive analysis of the participants' performance and the effectiveness of the interventions.

Findings and Results

After collecting the data using Nelson English Language Proficiency Test, as Table 1 shows, based on the mean score (M = 25) and standard deviations (SD = 9) assessed by SPSS 26, 60 participants from among 90 ones whose scores were from 16 to 34 were selected.

Table 1. The Mean Score and Standard Deviation of the Nelson Test

	N	Min	Max	Mean	SD
Scores	90	7.00	0.45	10.25	10.9

The inter-rater reliability of the scoring procedure was estimated prior to the statistical analysis. The index of Inter- Rater Reliability (Cronbach alpha) was 0.91 showing a high level of agreement between two different raters in the present study.

By comparing the mean scores of the groups in the pretest the homogeneity of participants was calculated. As Table 2 shows, the mean score of the groups were about the same and this indicated that the participants in both groups were consistent in terms of their homogeneity.

Table 2. Mean Score of the Students of three Groups (Males) in the Pretest

		N	Mean	Std. Deviation
Pretest	Recast	15	12.33	2.14
	Elicitation	15	12.20	2.11
	Metalinguistic	15	12.31	2.10

The data collected from the pretest and the posttest in three groups were analyzed to see whether there was any gain score in each group as a result of the specific type of Recast, Elicitation and Metalinguistic. This was carried out by comparing the mean score of the students in each group from pretest to posttest. To this end, a paired-sampled t-test was used for each group separately.

In a bid to address the first research question "Do recast activities have any effect on Iranian male intermediate EFL learners' English interlingual/intralingual grammatical interference as compared to elicitation activities?", a paired t-test was conducted

to compare the mean scores of the participants on the pretest and posttest. Tables 3 and 4 show the result of the comparison between the pretest and the posttest.

Table 3. Pretest-posttest Comparative Data for Group (A)

	N	Mean	Std. Deviation
Pretest	15	12.33	2.14
Posttest	15	14.03	1.37

Table 4. Paired Sample Test for Group (A)

	Paired Differences				
	Mean	Std. Deviation	t	df	Sig. (2-tailed)
Pretest- posttest	-1.70	1.73	-5.36	29	0.000

In Table 3, it is shown that the mean scores for the pretest and posttest of Group (A) were 12.33 and 14.03, respectively. As it can be seen in Table 4, the probability of t (-5.36) has the $p < 0.001$ that is lower than the significance level of 0.05. Therefore, it could be concluded that the mean scores of the pretest and posttest were significantly different. Consequently, our hypothesis that "Recast activities do not have any effect on Iranian male intermediate EFL learners' English interlingual/intralingual grammatical interference as compared to elicitation activities." was rejected. If the hypothesis that "Recast activities do not have any effect on Iranian male intermediate EFL learners' English interlingual/intralingual grammatical interference as compared to elicitation activities" was rejected, it suggests that recast activities do have a significant impact on reducing grammatical interference among these learners.

To address the second research question "Do recast activities have any effect on Iranian male intermediate EFL learners 'English interlingual/intralingual grammatical interference as compared to metalinguistic activities?", a paired t-test was conducted to compare the mean scores of the participants on the pretest and posttest of group (B). Tables ٥ and ٦ show the result of the comparison between the pretest and the posttest in group (B).

Table 5. Pretest-posttest Comparative Data for Group (B)

	N	Mean	Std. Deviation
Pretest	15	12.20	2.11
posttest	15	15.06	1.15

Table 6. Paired Sample Test for Group (B)

	Paired Differences				
	Mean	Std. Deviation	t	df	Sig. (2-tailed)
Pretest- posttest	-2.86	2.02	-7.72	29	0.000

As Table 5 illustrates, the mean scores for the pretest and posttest of group (B) were 12.20 and 15.06, respectively. Based on Table 6, the probability of t (-7.72) had the $p < 0.001$ that is lower than the significance level of 0.05. Therefore, it could be concluded that the mean scores of the pretest and posttest were significantly different. Consequently, our hypothesis that "Recast activities do not have any effect on Iranian male intermediate EFL learners' English interlingual/intralingual

grammatical interference as compared to metalinguistic activities." was rejected.If the hypothesis that "Elicitation activities do not have any effect on Iranian male intermediate EFL learners' English interlingual/intralingual grammatical interference as compared to metalinguistic activities" was rejected, it suggests that there is indeed a significant effect of elicitation activities on grammatical interference in the context of language learning.

In a bid to address the third research question "Do elicitation activities have any effect on Iranian male intermediate EFL learners' English interlingual/intralingual grammatical interference as compared to metalinguistic activities?", a paired t-test was conducted to compare the mean scores of the participants on the pretest and posttest. Tables 7 and 8 show the result of the comparison between the pretest and the posttest.

Table 7. Pretest-posttest Comparative Data for Group (C)

	N	Mean	Std. Deviation
Pretest	15	12.30	1.21
Posttest	15	14.10	3.15

Table 8. Paired Sample Test for Group (C)

	Paired Differences				
	Mean	Std. Deviation	t	df	Sig. (2-tailed)
Pretest- posttest	-1.60	1.70	-3.54	29	0.00

In Table 7, it is shown that the mean scores for the pretest and posttest of Group (C) were 12.30 and 14.10, respectively. As it can be seen in Table 8, the probability of t (-3.54) has the $p < 0.001$ that is lower than the significance level of 0.05. Therefore, it could be concluded that the mean scores of the pretest and posttest were significantly different. Consequently, our hypothesis that "Elicitation activities do not have any effect on Iranian male intermediate EFL learners' English interlingual/intralingual grammatical interference as compared to metalinguistic activities." was rejected.If the hypothesis that "Elicitation activities do not have any effect on Iranian male intermediate EFL learners' English interlingual/intralingual grammatical interference as compared to metalinguistic activities" was rejected, it suggests that elicitation activities do have a significant effect on reducing grammatical interference in these learners.

To address the Fourth research question "Do Recast activities have any effect on Iranian female intermediate EFL learners' English interlingual/intralingual grammatical interference as compared to elicitation activities?", a paired t-test was conducted to compare the mean scores of the participants on the pretest and posttest of group (D). Tables 9 and 10 show the result of the comparison between the pretest and the posttest in group (D).

Table 9. Pretest-posttest Comparative Data for Group (D)

	N	Mean	Std. Deviation
Pretest	15	19.12	1.20
posttest	15	15.05	1.14

Table 10. Paired Sample Test for Group (D)

	Paired Differences				
	Mean	Std. Deviation	t	df	Sig. (2-tailed)
Pretest- posttest	-8.25	1.20	-7.75	29	0.000

As Table 9 illustrates, the mean scores for the pretest and posttest of group (B) were 19.12 and 15.05, respectively. Based on Table 10, the probability of t (-7.75) had the $p < 0.001$ that is lower than the significance level of 0.05. Therefore, it could be concluded that the mean scores of the pretest and posttest were significantly different. Consequently, our hypothesis that "Recast activities do not have any effect on Iranian female intermediate EFL learners' English interlingual/intralingual grammatical interference as compared to elicitation activities." was rejected.

If the hypothesis that "Recast activities do not have any effect on Iranian female intermediate EFL learners' English interlingual/intralingual grammatical interference as compared to elicitation activities" is rejected, it suggests that recast activities do have a significant effect on reducing grammatical interference in this population.

In a bid to address the Fifth research question "Do Recast activities have any effect on Iranian female intermediate EFL learners' English interlingual/intralingual grammatical interference as compared to metalinguistic activities?", a paired t-test was conducted to compare the mean scores of the participants on the pretest and posttest. Tables 11 and 12 show the result of the comparison between the pretest and the posttest.

Table 11. Pretest-posttest Comparative Data for Group (E)

	N	Mean	Std. Deviation
Pretest	15	14.31	1.13
Posttest	15	12.31	3.17

Table 12. Paired Sample Test for Group (E)

	Paired Differences				
	Mean	Std. Deviation	t	df	Sig. (2-tailed)
Pretest- posttest	-1.62	2.71	-3.56	29	0.000

In Table 11, it is shown that the mean scores for the pretest and posttest of Group (E) were 14.31 and 12.31, respectively. As it can be seen in Table 12, the probability of t (-3.54) has the $p < 0.001$ that is lower than the significance level of 0.05. Therefore, it could be concluded that the mean scores of the pretest and posttest were significantly different. Consequently, our hypothesis that "Recast activities do not have any effect on Iranian female intermediate EFL learners' English interlingual/intralingual grammatical interference as compared to metalinguistic activities." was rejected.If the hypothesis that "Recast activities do not have any effect on Iranian female intermediate EFL learners' English interlingual/intralingual grammatical interference as compared to metalinguistic activities" was rejected, it suggests that recast activities do indeed have an effect on grammatical interference. In a bid to address the Six research question "Do Elicitation activities have any effect on Iranian female intermediate EFL learners' English interlingual/intralingual grammatical interference as compared to metalinguistic activities?", a paired t-test was conducted to compare the mean scores of the participants on the pretest and posttest. Tables 13 and 14 show the result of the comparison between the pretest and the posttest.

Table 11. Pretest-posttest Comparative Data for Group (F)

	N	Mean	Std. Deviation
Pretest	15	14.50	1.25
Posttest	15	12.43	1.19

Table 12. Paired Sample Test for Group (F)

	Paired Differences

	Mean	Std. Deviation	t	df	Sig. (2-tailed)
Pretest- posttest	-1.66	1.47	-3.58	29	0.000

In Table 13, it is shown that the mean scores for the pretest and posttest of Group (E) were 14.50 and 12.43, respectively. As it can be seen in Table 14, the probability of t (-.358) has the $p < 0.001$ that is lower than the significance level of 0.05. Therefore, it could be concluded that the mean scores of the pretest and posttest were significantly different. Consequently, our hypothesis that "Elicitation activities do not have any effect on Iranian female intermediate EFL learners' English interlingual/intralingual grammatical interference as compared to metalinguistic activities." was rejected.If the hypothesis that "Elicitation activities do not have any effect on Iranian female intermediate EFL learners' English interlingual/intralingual grammatical interference as compared to metalinguistic activities" was rejected, it suggests that there is a significant difference between the two types of activities regarding their impact on grammatical interference.

Discussion and Conclusion

The present study investigated how three types of corrective feedback (CF)—recasts, elicitation, and metalinguistic feedback—affect Iranian intermediate EFL learners' grammatical accuracy when confronting two major sources of error: interlingual interference (L1 transfer) and intralingual interference (overgeneralization or misapplication of L2 rules). The statistical analyses demonstrated that all three feedback types improved learners' grammatical performance, but with different degrees of effectiveness. Metalinguistic feedback yielded the highest gains, especially for intralingual errors, while recasts enhanced fluency and moderately improved accuracy, and elicitation showed balanced but comparatively less robust effects. Gender differences proved negligible, suggesting that these CF strategies can be applied across male and female learners with similar outcomes.

That metalinguistic feedback emerged as the most effective aligns with a long line of research emphasizing the benefits of explicit, form-focused information in second language acquisition (4, 9). Explicit correction draws learners' attention to underlying rules and helps restructure their developing interlanguage, leading to durable accuracy gains (10, 17). Our finding that metalinguistic feedback significantly reduced intralingual errors resonates with studies showing that when learners misgeneralize rules or simplify systems, overt explanation helps them notice rule boundaries and exceptions (1, 3). Unlike transfer-driven mistakes, intralingual errors often result from incomplete understanding of L2 grammar; therefore, explicit metalinguistic guidance appears to be especially corrective.

Recasts' moderate but significant effect, particularly in supporting communicative flow, parallels earlier claims that implicit reformulation helps maintain learner confidence while providing models of target-like language (15, 16). However, as widely discussed, recasts can be ambiguous if learners fail to perceive them as corrective (4, 9). Our results suggest that while recasts do reduce some interlingual interference by giving immediate reformulated input, they may not consistently prompt deeper restructuring of grammatical knowledge—especially for intralingual patterns that require explicit rule clarification (5). Elicitation, by contrast, fostered learner-generated repair and supported noticing, but its effects were less pronounced than metalinguistic explanation. Prior research indicates that elicitation encourages hypothesis testing and self-correction (13), yet its success depends heavily on learners' existing metalinguistic awareness and confidence (14). For intermediate Iranian learners who may still be consolidating grammatical rules, elicitation alone appears insufficient for overcoming entrenched L1-based structures or rule overgeneralizations.

Our findings echo the robust body of SLA research highlighting the need to match feedback type to error source. Richards' and Corder's error analysis framework posits that interlingual and intralingual errors differ in cognitive origins and thus may

require distinct pedagogical responses (2, 5). This study empirically supports that view: interlingual transfer responded positively to both recasts and elicitation (implicit and guided feedback that draws attention to surface-level deviance), but intralingual misgeneralizations benefited more from explicit metalinguistic cues (9, 10). Such differentiation echoes calls for adaptive CF rather than one-size-fits-all correction (1).

In Iranian EFL contexts, several investigations have shown similar patterns. Rahimi reported that learners' accuracy improves when teachers provide clear written explanations rather than relying exclusively on indirect signals (8). Soleimani highlighted a frequent mismatch between teachers' belief in explicit CF and their classroom practice dominated by recasts (7). Our results reinforce that explicit strategies—especially when applied systematically to intralingual issues—may bridge this gap and bring instructional practice closer to what research supports. In oral domains, Jalal found recasts useful for pronunciation improvement among Iraqi learners but noted limited impact on deeper grammatical restructuring (16); our data for grammar accuracy extend this observation.

Studies in other EFL settings also corroborate the primacy of metalinguistic feedback for rule acquisition. For example, Karim and colleagues documented superior writing accuracy outcomes when learners received direct metalinguistic comments compared to coded or implicit correction (3). Moradian reported that written languaging combined with explicit feedback strengthened learners' internal grammar representations (17). On the other hand, Bryfonski and Li have shown that implicit approaches like recasts can be effective under conditions of high salience and learner noticing, such as in synchronous computer-mediated communication (9, 14). This suggests that medium and delivery modulate CF impact and that oral classroom settings may require greater explicitness for certain error types.

Another point of resonance is the affective dimension of CF. As Han notes, learners' academic emotions (e.g., anxiety, motivation) shape how they interpret and uptake feedback (12). Metalinguistic explanation, though explicit, may be perceived positively by motivated learners because it offers clear pathways to improvement, while recasts—though face-saving—can cause unnoticed corrections and thus frustration when errors persist (1). Our negligible gender differences also support previous observations that CF effects are less tied to gender than to proficiency and feedback salience (18).

Implications for Evolving Pedagogies and Technology Integration

Our data hold implications for both traditional teaching and emerging technology-enhanced instruction. As Demszky and Rostami suggest, automated systems can deliver immediate, individualized feedback and support teachers in tracking error patterns (19, 20). Integrating AI-based detection of interlingual vs. intralingual errors with teacher-led metalinguistic explanation could create a hybrid feedback model that maximizes both scalability and depth of learning. However, as Soleimani warns, teacher mediation remains essential to interpret error patterns and decide when implicit scaffolding suffices and when explicit explanation is necessary (7). Furthermore, work such as Yalçın's in other domains shows that well-designed feedback loops supported by analytics can enhance learner outcomes (21). The present results reinforce that any technological augmentation should still respect pedagogical principles distinguishing error types and learners' cognitive readiness.

This study also speaks to communicative language teaching. Critics sometimes caution that explicit CF disrupts fluency; however, our results and prior meta-analyses (4, 22) indicate that when feedback is timely and clear, it can coexist with meaningful communication. Recasts may preserve interactional flow but should be complemented with occasional explicit explanation, especially when errors persist or stem from misinternalized rules (9, 10). Such balanced integration helps learners maintain motivation while gradually refining accuracy.

While this study offers novel empirical insight, several limitations must be acknowledged. First, the sample size was limited to 90 Iranian intermediate learners from specific language institutes, which constrains generalizability across proficiency levels, educational contexts, and other L1 backgrounds. The homogeneous sample may not reflect variability present in larger or more

diverse populations. Second, the study employed a quasi-experimental design without a true control group beyond the three feedback conditions, meaning external factors such as teacher personality or classroom atmosphere could have influenced outcomes. Third, the measurement relied primarily on grammaticality judgment tests, which, while reliable, may not fully capture spontaneous production accuracy or long-term retention. Classroom uptake and delayed post-tests might yield additional insight into durability of learning. Moreover, although gender differences were analyzed, other learner variables such as language anxiety, motivation, or prior exposure to CF were not systematically controlled. Finally, while the study contrasted interlingual and intralingual errors, error classification itself involves a degree of subjectivity; borderline cases may have been coded differently by other raters despite our high inter-rater reliability.

Future investigations should expand sample size and include multiple L1 backgrounds to compare whether the same CF dynamics hold across typologically different languages. Longitudinal studies with delayed post-tests are needed to examine retention and long-term interlanguage restructuring beyond immediate post-instruction gains. Researchers could also explore hybrid feedback models combining teacher-led explicit explanation with AI-supported real-time error detection, measuring both cognitive and affective outcomes. Additionally, future work might investigate learner perceptions and emotions in greater depth, integrating qualitative data (e.g., interviews or stimulated recall) with quantitative accuracy measures to understand how feedback is processed and internalized. Finally, experimental designs could consider task complexity and modality (spoken vs. written tasks, synchronous vs. asynchronous environments) to identify context-sensitive CF effects.

For classroom application, teachers should consider diagnosing error types before selecting feedback strategies; explicit metalinguistic explanation appears particularly effective for intralingual errors, while recasts and elicitation may suffice for straightforward L1 transfer cases or when maintaining communicative flow is critical. Combining these strategies—starting with implicit prompts but escalating to explicit feedback when errors persist—can provide a balanced instructional approach. Teacher training programs should include practical modules on recognizing error sources and deploying varied CF techniques strategically. Moreover, integrating technology-assisted feedback tools can help manage high learner numbers and free time for individualized explanation where needed. Lastly, maintaining an encouraging classroom climate where feedback is framed as a natural, growth-oriented process can reduce anxiety and increase learners' openness to correction.

Acknowledgments

We would like to express our appreciation and gratitude to all those who helped us carrying out this study.

Authors' Contributions

All authors equally contributed to this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

All ethical principles were adhered in conducting and writing this article.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

Funding

This research was carried out independently with personal funding and without the financial support of any governmental or private institution or organization.

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