



**IMPACT OF DIFFERENT FORMS OF CORRECTIVE FEEDBACK
UPON THE TESTING EFFECT**

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ABSTRACT

The study aimed to measure how different forms of Corrective feedback impact upon the testing effect. Furthermore, the body of work shall serve as an extension to the existing research by Kang et al. (2007). The students at Cardiff University (N=132) were assigned to the experimental conditions. The hypothesis of the study was corrective feedback which includes a prompt to check answers will produce higher final test scores than other forms of corrective feedback. One way ANOVA within design was statistically used to interpret the findings of the study which highlights the main effect in the learning phase while no effect was observed in the testing phase. Moreover, it was also found that while corrective feedback is generally considered a useful tool for promoting learning, it is not always effective or appropriate in every situation. Teachers and educators need to consider a range of factors to ensure that feedback is used in a way that is both effective and

appropriate for their learners. The study also discusses the best practices for corrective feedback and strategies to improve the same.

Keywords: *Corrective feedback, testing effect*

INTRODUCTION

Corrective feedback (CF) is given through remarks that provide information on how to improve, after making mistakes or giving a poor performance (Mouratidis et al., 2010). It can be used in variety of fields such as in academic settings. For instance, teachers use corrective feedback to get students' attention and help them change or fix their mistakes. In sectors like sports, to improve future performances, CF focuses more on the qualitative elements of the performance or processes in which the athlete has faltered. A coach needs to be aware that CF in sports is both necessary and challenging to give. "Feedback" does not equate to criticism, whether it is helpful or not. It is intended to reflect what the person or group receiving it has put out, rather than the other way around.

Nevertheless, since other people aren't mirrors, that reflection is their perspective of what the recipient of the criticism intended or did. After making mistakes or giving a poor performance, corrective feedback (CF) is given through remarks that provide information on how to improve (Mouratidis et al., 2010). The development of some cognitive functions from childhood until adulthood may be influenced by the subject's self-assurance. Children's performance is thus influenced by both their own direct interactions with the environment and the opinions of others (Bandura et al., 2001). This approach increases self-efficacy, which is defined as a judgement of one's capacity to attain a particular standard of performance.

The process of learning depends heavily on corrective feedback (Fernández-Bustos et al., 2021). Several studies have described feedback from two different angles (Moret-Tatay et al., 2016). From a cognitive point of view, students acquire knowledge to enhance their learning process and the best course of action in future circumstances; and from a motivational standpoint, students comprehend what they should do and that creates a sense of control over their own learning that aids them in moving forward. Researchers states that “corrective feedback offends those who feel they have arrived and motivates those who seek to improve.” Life involves various instances where it’s essential to both give and receive feedback. Sometimes the criticism you give or receive is neither necessary nor intended to be. However, other feedback is a serious effort to assist the recipient in enhancing their performance, behavior, cognition, connections, or interpersonal skills. All individuals require constructive feedback from time to time to have effective and efficient learning.

According to the researchers, corrective feedback may aid young participants in finding a better balance between speed and accuracy (Appelgren et al., 2014). Additionally, participants in old age groups display a more conservative approach (Touron et al., 2014), reducing latencies to reduce errors and using similar limits (Hawkins et al., 2015). In other words, as we become older, it seems like learning more about our own performance causes us to make slower but have more correct decisions. Whether or not to give participants trial-by-trial corrective feedback regarding the correctness of their performance on cognitive tasks is a key decision in experiments using cognitive psychology paradigms. Giving people feedback can help them become aware of any differences between their current levels of performance and their desired states, enabling them to assess their past performance considering a certain standard (Krenn et al., 2013). Several researchers have looked at how it affects various factors like learning and motivation. There hasn't

been as much research done, though, on how corrective accuracy feedback affects performance on tasks that call for only cognitive-based decision-making. So, the current study focuses on such work.

Types of Corrective Feedback

It is worth noting that corrective feedback is of various types and is explained in Figure 1 below:

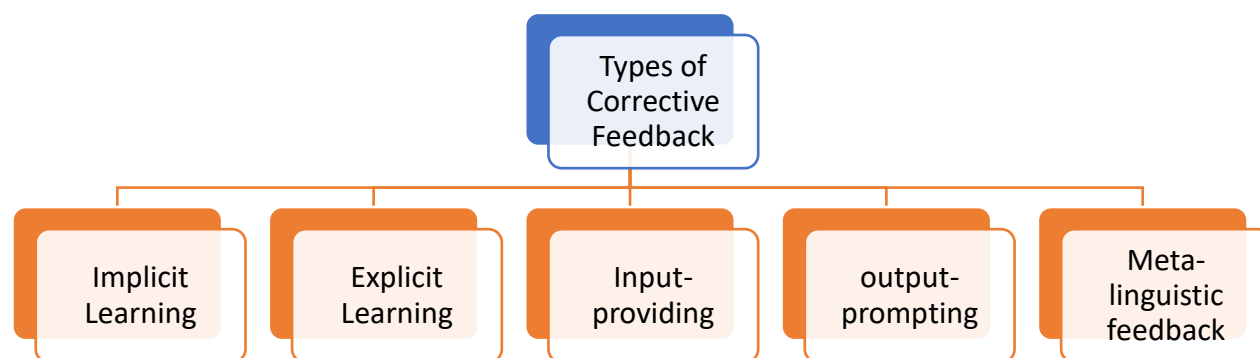


Figure 1

Types of Corrective Feedback based on Learning.

Figure (1) above explains the types of corrective feedback based on learning. Depending on whether it is oral or written, the context, and the nature of the error made, corrective feedback (CF) can take many various forms.

Oral Feedback: In oral feedback, implicit CF typically only indicates to the learner that his or her speech had a mistake by having them repeat it with rising or falling intonation (for example, recast), whereas explicit CF specifically identifies the mistake and typically provides the

appropriate form. Typically, oral feedback is thought to take place between a teacher and students (Hadzic, 2016). Oral feedback is typically given as a task is being completed. Because it is less formal, it is frequently undervalued, but because it can be easily supplied in the "teachable moment" and in a timely manner, it can be a very strong and successful technique (NWS Government, 2021). Oral feedback improved the learning environment's responsiveness. Before, pupils who were worried about giving the incorrect answer were more assured. They began to provide constructive criticism, which helped them understand the lesson and the proper format for writing. Written feedback, on the other hand, is frequently provided after an assignment. Because it differs slightly from oral feedback in that it necessitates written comments and a different type of correction, written feedback is occasionally seen as ideal. Written criticism is criticism provided to pupils' written work (Hadzic, 2016). Students who receive effective written feedback have a record of their accomplishments, areas for development, and suggested future steps. When direct corrective feedback was used, it was clear that the students were very motivated.

Implicit and Explicit feedback: Another overlapping dichotomy is between implicit and explicit CF and input-providing vs. output-prompting CF. Input-providing, as the names imply, provides the proper form (either implicitly or explicitly), whereas output-prompting, the pupils are urged to identify the mistake and make their own corrections (Ellis, 2009). In the case of written CF, the feedback may be either direct or indirect, in which case the students are given the appropriate forms or are informed of an error and asked to fix it on their own, as appropriate. The literature on this continuum of directness and indirectness also mentions a different type of feedback that falls somewhere in the middle of the continuum, namely metalinguistic feedback. It is defined as feedback that "contains either remarks, facts, or questions relating to the well-formed of the student's speech" and that omits the proper structure. The three different kinds of

metalinguistic feedback (comment, information, and inquiry) - all aim to get the students to use the right words, but only the information typically provides grammatical meta-language regarding the mistake that was made; the other two may or may not do so.

Implicit learning, in the context of education, is defined as "acquiring information about the underlying structure of a complex stimuli environment by a process that takes place spontaneously, simply, and without conscious operations," as opposed to explicit learning, which is defined as "a more conscious operation where the individual creates and tests hypotheses in pursuit of a structure." (Ellis, 1994).

In the context of knowledge, implicit knowledge is that which learners are only intuitively aware of, and which is readily accessible through automatic processing, while explicit knowledge is that which learners are consciously aware of, and which is typically only accessible through controlled processing. Several types of corrective feedback vary in how explicit or implicit they are. Unlike explicit feedback, implicit feedback does not make a clear indication that an error has been made.

Explicit feedback makes a clear indication that an error has been made and provides direct information on how to correct it. It involves conscious and deliberate instruction aimed at correcting the error. In contrast, implicit feedback does not explicitly point out the error, but rather provides subtle cues or hints that guide the learner towards the correct answer or solution without directly indicating the error. Implicit feedback can be more subtle and indirect, requiring learners to infer the correct response without being explicitly told what the error was. It allows learners to engage in their own discovery process and encourages them to actively analyze and reflect on their

performance. Implicit feedback can promote implicit learning by allowing learners to internalize the correct structure or pattern through repeated exposure and practice.

According to the findings of Lyster and Ranta's (1997) study, learner-generated repair was more successfully facilitated by elicitation, metalinguistic feedback, clarification requests, and repetition than by recasting and explicit correction. This is because the types of corrective feedback made learners more conscious of their mistakes and enabled learner-generated repair. Samuda (2001) argued that a teacher may be able to direct students' attention towards form-meaning relationships using either implicit or explicit techniques, but she discovered that to get students to use the target features, explicit feedback involving metalinguistic comments and elicitation was required. Contrary to the research described above, several studies have backed up implicit types of feedback. The analysis of 10 hours of transcribed interaction was done by Panova and Lyster (2002). The findings showed that recasts and translations, two implicit types of reformulate feedback, clearly outperformed other feedback types that promote learner-generated repair. As a result, this classroom had poor rates of learner uptake and quick error correction.

Effect of Corrective Feedback on Cognitive based Performance

In an experiment by Starns and Ratcliff (2010), participants viewed a grid of characters measuring 10*10 with some cells left blank and others randomly filled with asterisks. This experiment provided views on the impact of accuracy feedback on cognitive tasks performance. Identifying whether the number of asterisks displayed was greater than or fewer than 50 required quick yet accurate decision-making. Asterisks were consistently displayed on each trial in an amount ranging from 31 to 70. A post-trial corrects, or error message was displayed in a feedback

condition, and no feedback conditions. When Ratcliff diffusion model was fitted to the collected response time (RT) values, it was discovered that giving college students' feedback had a large impact on lowering the decision boundaries. Additionally, according to the researchers, feedback made the younger participants more aware of the possibility of striking a balance between speed and accuracy, inspiring them to make improvements that ultimately resulted in more optimal response. When provided feedback, the younger group's response criteria were significantly closer to what the authors called the "reward-rate optimal boundary" rather than the one in the younger group who did not get feedback.

The impact of accuracy feedback on cognitive task performance on strategy choice is a second related viewpoint. It helps participants assess the suitability of various potential processes that they might employ for the current job. Participants in Touron and Hertzog's (2014) study completed a task that, with some practice, could be completed using either a quick but occasionally inaccurate memory retrieval technique, or a more time-consuming but highly accurate visual search strategy. In comparison to a group that received no feedback, they noticed an increase in the trial-by-trial, self-reported use of memory retrieval for the accuracy feedback group.

A further viewpoint on the impact of accurate feedback on basic cognitive task performance is that it modifies the quantity and direction of effort put into a task (Krenn et al., 2013). Performance on the traditional Stroop task is scrutinized in the first future investigation within the context of the current research. In incongruent Stroop trials, more errors are often made in a Stroop task. Hence, corrective feedback during such a task could increase participants' awareness of the fact that the irrelevant stimulus characteristic is influencing their responses and that more work needs to be put towards limiting the processing of it.

Effect of Corrective feedback on Motivation based Performance

Many studies have been done on motivation, which mostly relates to factors like student success in language acquisition, attitudes towards the target language, motivational intensity, etc. Some aspects, such as the availability of corrective feedback in the classroom, that may have an impact on this sociopsychological component were ignored in these investigations. All educational studies underlined that the teachers' feedback is the single most significant component that affects students' motivation. Feedback is therefore crucial for achieving learners' objectives. It gives the students the opportunity to alter their efforts and choose which objectives to pursue and which to abandon to advance their proficiency in the writing process. Without input, motivational headquarters is essentially cut off from action, according to Martin Ford (1992). Feedback has a significant impact on student motivation because it helps teachers and students to communicate trust, which in turn motivates them to help students develop good self-concepts and self-confidence.

Motivation has been described by some psychologists in terms of needs. According to Ausubel (1968), there are a few primary needs that shape learner motivation: the need for stimulation, the desire to be stimulated by one's surroundings, other people, or concepts, ideas, thoughts, or emotions. In order to process and internalize the results of exploration, manipulation, activity, and stimulation, to resolve contradiction, to search for solutions to problems, and for self-consistent systems of knowledge, there are three needs: (a) the need for knowledge, which is defined as the need for achievement (Good and Brophy, 1990); (b) the need for ego enhancement, for the self to be known and to be accepted and approved by others; and (c) the need for knowledge.

According to Harklau (2002), learning to write in the target language is not enough for people learning a second language; they must also acquire the second language through writing. In their 2001 study, Lavelle and Zuercher looked at students' perspectives on writing as well as writing practices in higher education. The results show how crucial it is to support university students' writing by integrating complete activities, placing an emphasis on revision, and meaning, scaffolding learners' learning, modelling, and teaching writing across the curriculum.

One of the key elements in boosting students' enthusiasm to learn a language, particularly in writing, is feedback. Yet, Ellis (2009) noted that "feedback is considered as a tool of adopting students' motivation and guarantying linguistic accuracy" in both communicative and structural approaches to language teaching. To put it in another way, motivating pupils to write is a difficult task for teachers since they need to know how to pique their interest, particularly in classes where they are learning a foreign language. One of the key strategies for assisting student writers in improving their writing is to provide constructive feedback. This aids the students in developing their writing skills. It will be more challenging to correct faults later if they are neglected in the beginning without any feedback. It should be offered as a result because it is beneficial for students. If the teacher marks up the students' writing, it will help the pupils understand where they made mistakes. The kids' ability to learn from their teacher's criticism will help them avoid those errors in the future.

Current Study: Background

In the past ten years, there has been an increase in interest in the function of corrective feedback. The forms of corrective feedback that students receive and the degree to which this feedback is noticed, taken in, or both by the students have been explored in a variety of descriptive

studies using data gathered in classrooms and in laboratory-type settings. The role that corrective feedback plays in acquisition has been investigated experimentally. The current study will focus, if different forms of corrective feedback impact upon the testing effect or not.

The effect of increased academic performance following a test is known as the testing effect (Kang, 2007). Yang (et al., 2021) has provided evidence through a meta-analysis that the testing effect may be strengthened when corrective feedback is provided to learners. However, little research has been conducted into how different types of corrective feedback impact upon the testing effect. Kulhavy (1977) has suggested that increasing the complexity of the corrective feedback given does not necessarily increase the benefit of the testing effect and suggests that there is an optimum complexity for the feedback that is given. Kang and Han (2015) suggested that the forms of corrective feedback play a significant role in enhancing the testing effects. The study of Semke (1980) which investigated the testing effects incurred by four types of feedback and the study of Mabarak (2013) which tested three types of feedback, showed support on forms of feedback did enhance the testing effects.

The general phrase "corrective feedback" is used to describe a variety of approaches that fall along a continuum. These are actions that provide learners with clues or target reformulations of non-target like output. Explicit correction, explicit correction with metalinguistic input, and recasts are all examples of reformulations. Meta-linguistic cues, elicitation, requests for clarification, and repetition are all prompts that encourage students to self-correct.

- a) **Recasts** entail the teacher restating all or part of what the student said. They consist of
- (a) conversational recast, which aims to improve a communication breakdown, and
 - (b) didactic recast, which serves as a reformulation when there is no communication issue.

- b) The explicit giving of the right form is known as **explicit correction**. It consists of two parts: (a) explicit correction, which is a reformulation and a clear identification of the error, and (b) explicit correction with metalinguistic feedback, which identifies the error, offers the appropriate form, and makes a metalinguistic observation.
- c) A **metalinguistic clue** is a comment intended to encourage learners to self-correct their own language use.
- d) **Elicitation** is a method for getting students to rectify themselves by asking them wh-questions.
- e) **Repetition** is the act of repeating the student's incorrect statement while changing the intonation.
- f) **Clarification Requests** is a sort of feedback that might refer to issues with clarity, accuracy, or both. Repetition and requests for explanation are classified by Lyster and Ranta (1997) as implicit kinds of prompts, while metalinguistic cues and elicitation are classified as explicit forms of prompts.

Therefore, the purpose of the study is to investigate whether a particular form of corrective feedback provides an advantageous effect to the testing effect. The results of this investigation have wider applicability to educational settings, especially given the use of dialogic teaching (Doukmak, 2014). Given the two-way nature of the teaching and feedback process, this study may help to establish relatively simple to implement changes to how feedback is provided to increase the testing effect and result on academic performance.

METHODOLOGY

Hypothesis

Corrective feedback which includes a prompt to check answers will produce higher final test scores than other forms of corrective feedback.

Sample

Initially, up to 175 participants were planned to be recruited for the final study. The effect size (f) of Muparak (2013) study which was 0.122 was replicated. Therefore, the targeted participants were 110. 34 participants were excluded because of the exclusion criteria, resulting in 141 valid data in our analysis.

The data of the current study was collected from participants through EMS (experimental management system) who were psychology students also; through Prolific, and in-person. Participants were recruited through the EMS System of Cardiff University and were asked to finish the test in the lab. Total of 27 participants did the study in the laboratory settings. However, 6 participants did not turn up in the second phase of the study. So, 21 participants participated through the laboratory settings. In case where number of participants were not enough to achieve the study target, the participants were recruited through Prolific. The test was created online on EMS, 39 participants participated in the study; 16 participants had taken voluntary withdrawal from the study, 44 participants were taken into consideration from EMS.

Participants were granted 3 credits for agreeing to participate in EMS System of Cardiff University or were compensated financially according to the duration of the study, paid through Prolific. Participants were at least 18 years old and fluent in English.

Participants who did not fully complete the questionnaire were excluded from the analysis.

The exclusion criteria of the study were as follows:

- a. The participants took more than 45 minutes to complete the study.
- b. The participants who took more than 200 hours between the first and second phase of the study, i.e., The participants who didn't adhered to the 7 days recall time of the study.
- c. The participants who didn't score below and above 3 standard deviations from the mean.
- d. The participants who did not participated in either of Part 1 or Part 2 of the study.

Materials

The study involved a 15-minute computerized questionnaire which was completed online. Cardiff University Research Ethics Committee approved the study. It was completed Qualtrics enables researchers to build a survey and construct an anonymous link, which was distributed via EMS to the participants. The 15 questions of the study were adapted from the work of Kang et al (2007).

Research Design

The study is an experiment with a within-subjects design with one independent variable (the type of corrective feedback) with three different levels (three different types of corrective feedback). All participants read the passage and completed the multiple-choice test.

Procedure

The current study was done by varying the types of corrective feedback received by participants completing a quiz on a passage of text. After reading an article, participants were

asked to complete a multiple-choice quiz, which was split into three randomized and blind blocks providing different forms for corrective feedback. A week later, the same quiz was provided, and the results were compared across the different blocks of corrective feedback to ascertain whether any form of feedback led to a significant increase in performance. Participants were asked to read a passage suggested by Kang et al. (2007) and complete a multiple-choice test on what they read. Feedback was provided during the test in three different blocks, which was then counterbalanced. One block informed if the answers were correct or not, another explained the correct answer and the final block prompted the person to reconsider their answer if it was initially incorrect.

A week elapsed before the test was taken again to view which form of feedback on the initial test led to the greatest retention over time. Individuals received all types of corrective feedback, but participants were not made explicitly aware of what type of feedback they were receiving in each block. Each block was presented in a random order using the survey software Qualtrics, thus the researchers were not involved in assigning the order of each block to participants. One question was also removed from the rethink block of the study.

Participants signed up for the study on the EMS system. Through that platform, participants accessed the link to Qualtrics.

Subjects were informed that they had the right to withdraw at any stage in the study without having to provide a reason, and that their data was anonymous. Participant consent was received online by ticking a box at the bottom of the consent form. The experiment was online based; therefore, participants completed the experiment on a laptop or PC computer in their own desired location. Firstly, all participants wrote the code by taking the first three letters of their favorite color and the last three digits of their mobile phone number. For example, if their favorite color is blue and their mobile number is 079034858697 their code would be BLU697. Then the participants

were asked to complete the set of 30 questions. After completing the experiment, the participants were thanked for their participation. The final page of the survey was the debrief form, informing participants about the true aims of the experiment. Finally, when they returned to the EMS portal, they received their participation credit.

RESULT

One-way within-subject ANOVA was used to analyze the final test scores. The manipulated independent variables are three types of feedback, which are a YES/NO response as to whether they answered correctly; a display of the correct answer or a prompt to check their answer had they answered incorrectly whereas the dependent variable is the participants' testing scores. The significance bar for what reaches significance at the standard $p < 0.05$ significance level to ascertain whether the results obtained in the ANOVAs are significant and thus allow us to reject the null hypotheses.

The data was collected following the above-mentioned method. Further it was analyzed using the SPSS software. The following data was obtained as shown in Figure 2 below:

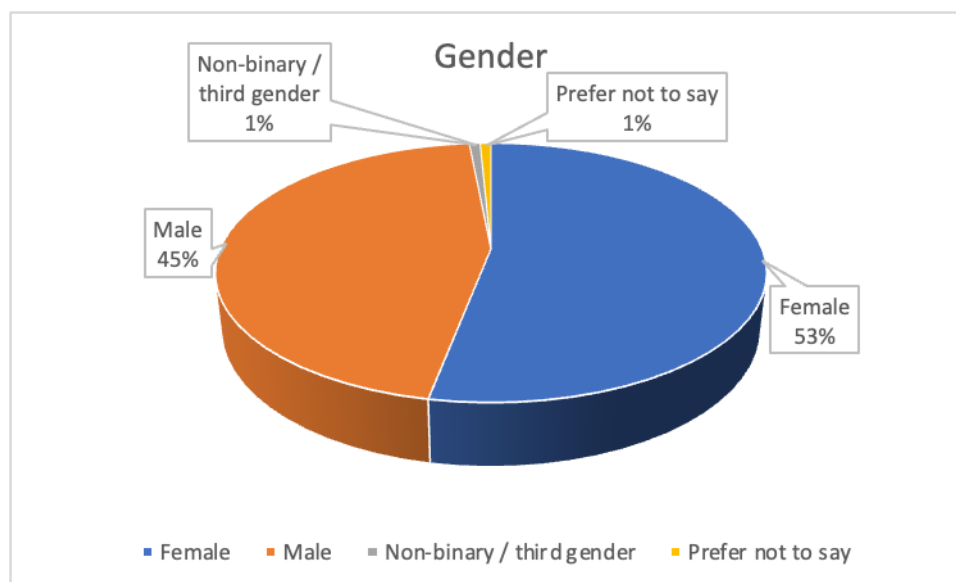


Figure 2

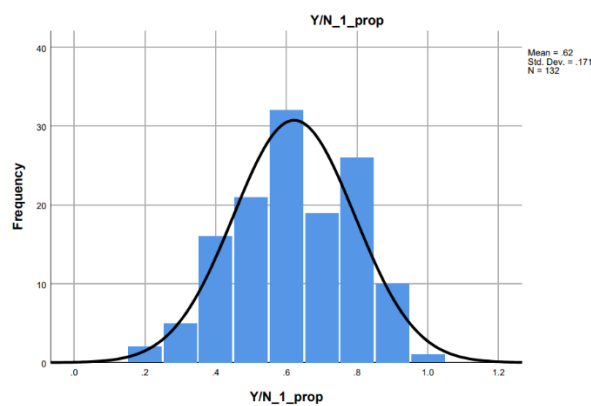
Distribution of participants based on gender

The above given pie chart depicts the distribution of the participants based on the gender. It can be observed that 45% of Males, 53% of females and 1% of non-binary or third gender has participated in the study. 1% of the participants has not revealed their gender in the study.

*Learning Phase***Table 1***Describing the Descriptive statistics of Learning Phase*

	Mean	Std. Deviation	N
Proportion Correct in Yes/No Block	0.622	0.171	132
Proportion Correct in Correct Ans Block	0.662	0.152	132
Proportion Correct in Rethink block	0.659	0.196	132

Table 1 shows that 132 participants participated in the study. The mean of Yes/No block is 0.622 with standard deviation of 0.17, Correct block is 0.66 with standard deviation of 0.15 and rethink block is 0.659 with standard deviation of 0.196.

**Figure 3***Distribution of Proportion Correct in Yes/No Block*

The graph illustrates the proportion of "Yes" and "No" responses, with a mean value of 0.62 and a standard deviation of 0.171. The normal probability curve is represented by the black line on the graph.

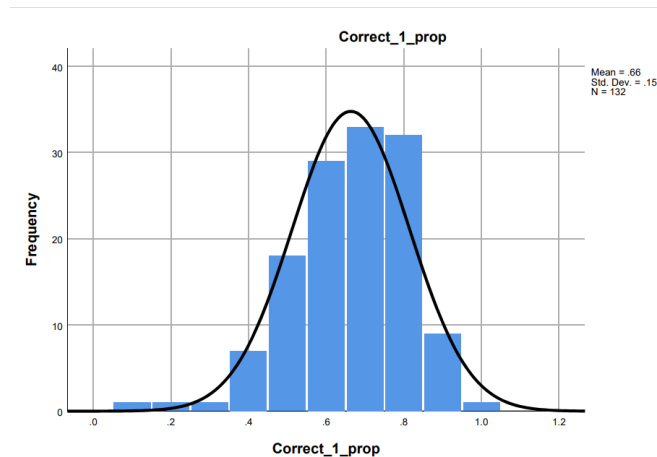


Figure 4

Distribution of Proportion Correct in Correct Ans Block

The graph illustrates the proportion Correct in Correct Ans Block, with a mean value of 0.65 and a standard deviation of 0.152. The normal probability curve is represented by the black line on the graph.

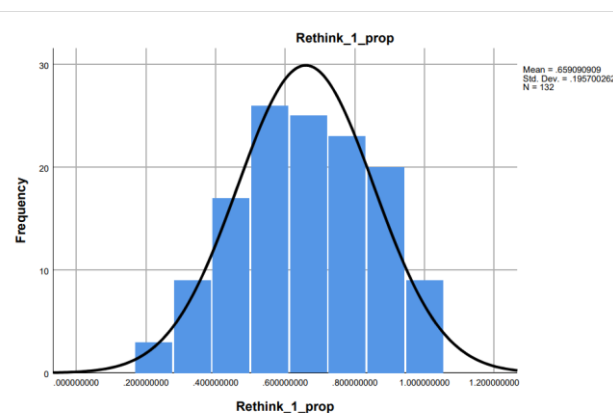


Figure 5

Distribution of Proportion Correct in Rethink block.

The graph illustrates the Proportion Correct in Rethink block, with a mean value of 0.66 and a standard deviation of 0.196. The normal probability curve is represented by the black line on the graph.

Table 2

Tests of within – subject effects

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
learning_phase	Sphericity Assumed	.138	2	.069	3.631	.028	.027
	Greenhouse-Geisser	.138	1.962	.070	3.631	.029	.027
	Huynh-Feldt	.138	1.991	.069	3.631	.028	.027
	Lower-bound	.138	1.000	.138	3.631	.059	.027
Error(learning_phase)	Sphericity Assumed	4.976	262	.019			
	Greenhouse-Geisser	4.976	256.959	.019			
	Huynh-Feldt	4.976	260.826	.019			
	Lower-bound	4.976	131.000	.038			

Table 2 provides an explanation of how Mauchly's Test of Sphericity is utilized to examine whether the assumption of sphericity is satisfied in a repeated measures ANOVA. Here the test of within-subject effects is measured and errors during learning phase are calculated. The table reveals that, during the learning phase, the within-subject effect has 2 degrees of freedom and a significance level of 0.28, which is greater than 0.05 and therefore deemed insignificant. As a result of the violation of the level of significance, the Greenhouse-Geisser correction is computed, which yields a significance value of 0.29. This correction method is used to address the issue of non-sphericity in a repeated measures ANOVA by serving as both an estimate of epsilon (sphericity) and a correction for non-sphericity. Based on the information in Table 2, the Huynh-Feldt correction is preferred to the Greenhouse-Geisser correction because the latter is overly

conservative. The Huynh-Feldt correction significance value is 0.028. The lowest value that epsilon (ϵ) can take is called the lower-bound estimate which is 0.059.

Table 3

Tests of within – subject contrasts

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	learning_phase	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
learning_phase	Level 1 vs. Level 3	.182	1	.182	4.361	.039	.032
	Level 2 vs. Level 3	.003	1	.003	.069	.793	.001
Error(learning_phase)	Level 1 vs. Level 3	5.464	131	.042			
	Level 2 vs. Level 3	5.162	131	.039			

Table 3 displays the results of a test that compares different conditions within the same group of participants. The test found that there was a significant difference between level 1 and level 3 during the learning phase, with a level of significance of 0.039, which is lower than the usual threshold of 0.05. This indicates that the difference is statistically significant. However, when comparing level 2 and level 3 during the learning phase, the level of significance was 0.793, which is higher than 0.05. Therefore, this comparison was not statistically significant, indicating that there is no significant difference between level 2 and level 3 during the learning phase.

Table 4

*Pairwise Comparison***Pairwise Comparisons**

Measure: MEASURE_1

(I) learning_phase	(J) learning_phase	Mean Difference (I-J)	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b	
					Lower Bound	Upper Bound
1	2	-.042 [*]	.016	.009	-.073	-.010
	3	-.037 [*]	.018	.039	-.072	-.002
2	1	.042 [*]	.016	.009	.010	.073
	3	.005	.017	.793	-.030	.039
3	1	.037 [*]	.018	.039	.002	.072
	2	-.005	.017	.793	-.039	.030

Based on estimated marginal means

^{*}. The mean difference is significant at the .05 level.^b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

The table above presents the results of a study that used a one-way ANOVA to assess whether there were any differences in preferences among three different learning phases. To test all possible pairwise comparisons between the means, the Tukey procedure was utilized. Specifically, the Tukey method is designed for situations where one wants to compare all possible combinations of two means. The study found that in the first learning phase, the p-values were 0.009 and 0.039, both of which were below the significance level of 0.05, indicating that there was a significant difference. However, in the second and third learning phases, the significance levels were 0.793, which is above the significance level of 0.05, indicating that the differences were not significant.

Table 5*Multivariate tests***Multivariate Tests**

	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Pillai's trace	.057	3.909 ^a	2.000	130.000	.022	.057
Wilks' lambda	.943	3.909 ^a	2.000	130.000	.022	.057
Hotelling's trace	.060	3.909 ^a	2.000	130.000	.022	.057
Roy's largest root	.060	3.909 ^a	2.000	130.000	.022	.057

Each F tests the multivariate effect of learning_phase. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Exact statistic

The table indicates that a multivariate test was conducted, and the level of significance was determined. A MANOVA is a statistical method that expands on the one-way ANOVA by including multiple response variables. During a MANOVA, statistical software typically generates four test statistics: Pillai's Trace, Wilks' Lambda, Lawley-Hoteling Trace, and Roy's Largest Root. The F-value for each test statistic remains constant in the table, and each corresponding p-value is less than .05, indicating statistical significance.

Test Phase**Table 6***Describing the Descriptive Statistics of Test Phase***Descriptive Statistics**

	Mean	Std. Deviation	N
Y/N_2_Prop	.585	.1805	132
Correct_2_Prop	.620	.1705	132
Rethink_2_Prop	.616161616	.173313126	132

Table 6 shows that 132 participants participated in the study. The mean of Yes/No 2 prop is 0.585 with standard deviation of 0.1805, Correct block_2_prop is 0.620 with standard deviation of 0.1705 and rethink block_2_prop is 0.616 with standard deviation of 0.173.

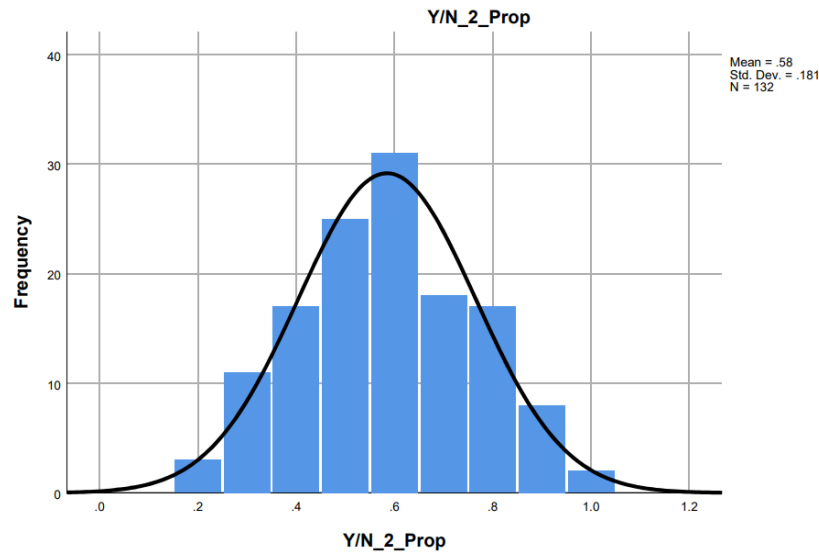
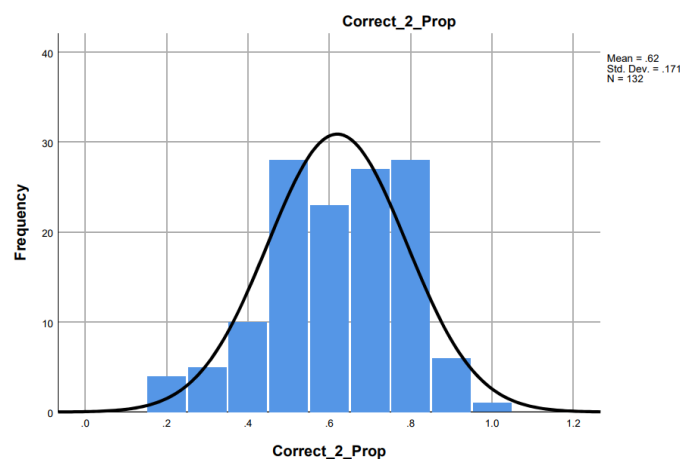


Figure 4

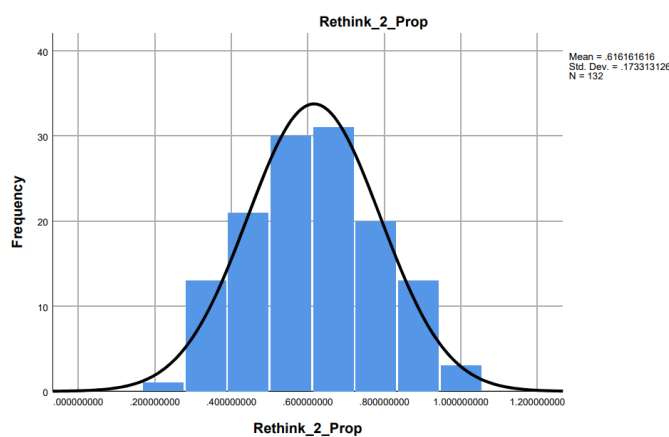
Distribution of Proportion Correct in Yes/No Block (TEST PHASE)

The graph illustrates the proportion of "Yes" and "No" responses in test phase, with a mean value of 0.58 and a standard deviation of 0.18. The normal probability curve is represented by the black line on the graph.

**Figure 5**

Distribution of Proportion Correct in Correct Ans Block (TEST PHASE)

The graph illustrates the proportion Correct in Correct Ans Block, with a mean value of 0.62 and a standard deviation of 0.171. The normal probability curve is represented by the black line on the graph.

**Figure 6**

Distribution of Proportion Correct in Rethink block (TEST PHASE)

The graph illustrates the Proportion Correct in Rethink block, with a mean value of 0.61 and a standard deviation of 0.173. The normal probability curve is represented by the black line on the graph.

Table 7

Tests of within – subject effects

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
test_phase	Sphericity Assumed	.097	2	.049	2.688	.070	.020
	Greenhouse-Geisser	.097	1.954	.050	2.688	.071	.020
	Huynh-Feldt	.097	1.983	.049	2.688	.070	.020
	Lower-bound	.097	1.000	.097	2.688	.103	.020
Error(test_phase)	Sphericity Assumed	4.733	262	.018			
	Greenhouse-Geisser	4.733	255.954	.018			
	Huynh-Feldt	4.733	259.782	.018			
	Lower-bound	4.733	131.000	.036			

Table 7 provides an explanation of how Mauchly's Test of Sphericity is utilized to examine whether the assumption of sphericity is satisfied in a repeated measures ANOVA. Here the test of within-subject effects is measured and errors during test phase are calculated. The table reveals that, during the test phase, the within-subject effect has 2 degrees of freedom and a significance level of 0.070, which is greater than 0.05 and therefore deemed insignificant. As a result of the violation of the level of significance, the Greenhouse-Geisser correction is computed, which yields a significance value of 0.071. This correction method is used to address the issue of non-sphericity in a repeated measures ANOVA by serving as both an estimate of epsilon (sphericity) and a correction for non-sphericity. Based on the information in Table 2, the Huynh-Feldt correction is preferred to the Greenhouse-Geisser correction because the latter is overly conservative. The

Huynh-Feldt correction significance value is 0.070. The lowest value that epsilon (ϵ) can take is called the lower-bound estimate which is 0.103.

Table 8

Tests of within – subject contrasts

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	test_phase	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
test_phase	Level 1 vs. Level 3	.129	1	.129	3.645	.058	.027
	Level 2 vs. Level 3	.002	1	.002	.052	.820	.000
Error(test_phase)	Level 1 vs. Level 3	4.651	131	.036			
	Level 2 vs. Level 3	4.148	131	.032			

Table 8 displays the results of a test that compares different conditions within the same group of participants. The test found that there was a insignificant difference between level 1 and level 3 during the test phase, with a level of significance of 0.058, which is higher than the usual threshold of 0.05. This indicates that the difference is statistically insignificant. However, when comparing level 2 and level 3 during the test phase, the level of significance was 0.820, which is higher than 0.05. Therefore, this comparison was not statistically significant, indicating that there is no significant difference between level 2 and level 3 during the learning phase.

Table 9

*Pairwise Comparison***Pairwise Comparisons**

Measure: MEASURE_1

(I) test_phase	(J) test_phase	Mean Difference (I- J)	Std. Error	Sig. ^a	95% Confidence Interval for Difference ^a	
					Lower Bound	Upper Bound
1	2	-.035	.018	.051	-.070	.000
	3	-.031	.016	.058	-.064	.001
2	1	.035	.018	.051	.000	.070
	3	.004	.015	.820	-.027	.034
3	1	.031	.016	.058	-.001	.064
	2	-.004	.015	.820	-.034	.027

Based on estimated marginal means

a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

The table above presents the results of a study that used a one-way ANOVA to assess whether there were any differences in preferences among three different learning phases. To test all possible pairwise comparisons between the means, the Tukey procedure was utilized. Specifically, the Tukey method is designed for situations where one wants to compare all possible combinations of two means. The study found that in the first, second and third test phase, the p-values were 0.051, 0.058, 0.082 which were above the significance level of 0.05, indicating that there was an insignificant difference.

Table 10*Multivariate Test***Multivariate Tests**

	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Pillai's trace	.035	2.355 ^a	2.000	130.000	.099	.035
Wilks' lambda	.965	2.355 ^a	2.000	130.000	.099	.035
Hotelling's trace	.036	2.355 ^a	2.000	130.000	.099	.035
Roy's largest root	.036	2.355 ^a	2.000	130.000	.099	.035

Each F tests the multivariate effect of test_phase. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Exact statistic

The table indicates that a multivariate test was conducted, and the level of significance was determined. A MANOVA is a statistical method that expands on the one-way ANOVA by including multiple response variables. During a MANOVA, statistical software typically generates four test statistics: Pillai's Trace, Wilks' Lambda, Lawley-Hoteling Trace, and Roy's Largest Root. The F-value for each test statistic remains constant in the table, and each corresponding p-value is more than .05, indicating statistical insignificance.

DISCUSSION

Corrective feedback is a crucial element of psychology that has been extensively examined by researchers and practitioners. It involves providing individuals with feedback aimed at correcting errors in their behavior or performance, with the goal of helping them improve and avoid repeating mistakes.

The study's findings indicate that the main impact of corrective feedback is observed during the learning phase, but no effect can be seen during the testing phase. The level of significance

was found to be insignificant at both the 0.01 and 0.05 levels during the testing phase, while it was significant during the learning phase. Since the results do not support the hypothesis, the hypothesis of the current study is rejected. From the above result section, it can be observed that the main effect is identified in the learning phase, however no effect can be observed in the test phase. The level of significance is found to be insignificant at 0.01 and 0.05 level in the test phase and significant at learning phase. Since the result tables did not support the hypothesis, the hypothesis of the current study was rejected. Corrective feedback is a process of providing information to learners about their performance to help them identify and correct errors in their understanding, skills, or behaviors.

This study aims to explore the benefits, challenges, and best practices associated with corrective feedback in psychology.

Benefits of Corrective Feedback

Corrective feedback has several significant benefits, such as helping individuals improve their performance by providing them with information on areas where they need to focus and specific goals to work towards. Additionally, it can help individuals avoid repeating mistakes in the future by identifying underlying causes and developing strategies to prevent them. This is especially crucial in high-stakes situations like healthcare or aviation.

In educational settings, several types of corrective feedback can be used, including explicit correction, recasting, clarification requests, elicitation, metalinguistic feedback, reformulation, and indirect feedback. Explicit correction directly corrects the learner's error by providing the correct answer or correcting their pronunciation, while recasting rephrases the student's incorrect statement in a grammatically correct way. Clarification requests ask the student to provide additional information to clarify their response, while elicitation feedback prompts the student to

think about the correct answer by asking leading questions. Metalinguistic feedback provides information about the language itself to help correct errors, and reformulation restates the student's response in a more accurate or appropriate way. Indirect feedback provides feedback without explicitly pointing out the error, such as modeling correct language use or providing examples without highlighting the student's mistake.

Challenges of Corrective Feedback

Delivering corrective feedback can be challenging as it requires expertise, sensitivity to the individual's emotions and needs, and skill. Moreover, individuals may not always be open to receiving feedback, especially if it's critical or perceived as unfair.

Another challenge is ensuring the effectiveness of corrective feedback. Providing feedback is merely the initial stage in improving performance, and individuals must also have the motivation and ability to make necessary changes. Moreover, factors like the individual's experience, motivation, and cognitive abilities can influence the effectiveness of feedback.

Best Practices for Corrective Feedback

To ensure that corrective feedback is effective, there are several best practices that should be followed. These include:

- a) Providing feedback in a timely manner: Feedback should be provided as soon as possible after the behaviour or performance in question has occurred.
- b) Focusing on specific behaviours or actions: Feedback should be specific and focused on the behaviours or actions that need to be improved.
- c) Using objective language: Feedback should be presented in a non-judgmental and objective manner, avoiding language that is critical or accusatory.

- d) Providing actionable recommendations: Feedback should include actionable recommendations for improvement, rather than simply identifying problems.
- e) self-reflection: Individuals should be encouraged to reflect on their performance and identify areas for improvement on their own.

Strategies to improve corrective feedback-

- a) Be specific and timely: Ensure that corrective feedback is specific, clear, and provided in a timely manner. Feedback should address the specific error or mistake that was made and be given as soon as possible after the error is made.
- b) Use positive language: Frame corrective feedback in positive language that focuses on what the learner did well, as well as areas for improvement. This can help to maintain learners' motivation and engagement and reinforce positive behaviors.
- c) Use different types of feedback: Consider using a variety of feedback types, such as verbal, written, or video feedback, to provide learners with different perspectives and formats for learning. This can help to accommodate different learning styles and preferences.
- d) Provide opportunities for practice and revision: Allow learners to practice and revise their work based on feedback. This can help learners to consolidate their learning and improve their performance over time.
- e) Consider individual differences: Consider individual differences in learners, such as their motivation, self-efficacy, and prior knowledge, when providing corrective feedback. This can help to tailor feedback to meet individual needs and promote more effective learning.

- f) Use technology: Consider using technology, such as automated feedback or online platforms, to provide more immediate and targeted feedback. This can help to increase the efficiency and effectiveness of feedback delivery and reduce the workload for instructors.
- g) Number of questions in a study: The higher the number of questions, the more valuable it would be. The number of questions was 10 in the study. If this would be more, it would have given the correct picture of the study.

There is a substantial amount of research on corrective feedback in second language acquisition (SLA). Here are some key findings:

- a) **Feedback type matters:** Research suggests that different types of feedback are more effective for different types of errors. For example, explicit correction may be more effective for errors related to grammar and vocabulary, while recasts may be more effective for errors related to pronunciation or pragmatics.
- b) **Timing matters:** Research suggests that immediate feedback is more effective than delayed feedback. However, some studies have also found that delayed feedback can still be effective, especially when paired with additional opportunities for practice.
- c) **Frequency matters:** Research suggests that providing feedback on every error is not always necessary or effective. Instead, providing feedback on a subset of errors or providing feedback intermittently may be more effective.
- d) **Learner characteristics matter:** Research suggests that learner characteristics, such as motivation, proficiency level, and learning style, can influence the effectiveness of corrective feedback. For example, learners who are highly motivated may benefit more

from explicit correction, while learners who are less confident may benefit more from recasts.

- e) **Interaction matters:** Research suggests that feedback provided in the context of interaction, such as in a conversation or during a task, may be more effective than feedback provided in isolation.

Overall, research suggests that corrective feedback can be an effective tool for improving language accuracy and proficiency, but its effectiveness depends on various factors, including feedback type, timing, frequency, learner characteristics, and the context in which feedback is provided.

Chen and Liu (2021) conducted a study to examine the effectiveness of corrective feedback (CF) provided by Chinese second language (L2) teachers to their students in mainland China. The researchers used an ecological approach, specifically the nested ecosystem model, to analyze data collected from interviews and stimulated recall interviews. They observed 22 class periods from 11 teachers and interviewed eight of them and analyzed the data using NVivo 11.

One noteworthy contribution of this study is its emphasis on the influence of indirect factors, particularly cultural and affective dimensions, on teachers' perceptions of CF effectiveness. This highlights the importance of considering cultural factors and teachers' emotions when providing CF in the context of mainland China. Additionally, the study suggests that CF effectiveness is dynamic and can be influenced by various factors and their interplay.

Overall, this study provides valuable insights into teachers' perceptions of CF effectiveness in the context of mainland China and emphasizes the role of indirect factors in shaping these

perceptions. The findings of this study can inform language teaching practices and provide useful information for language educators in designing effective CF strategies in similar contexts.

Experimental studies on corrective feedback have provided several key findings on how learners respond to different types of feedback. Here are some of the main takeaways:

- a) ***Explicit correction is more effective for some types of errors***: Studies have found that explicit correction (i.e., directly providing the correct answer) is more effective for errors related to grammar and vocabulary, while other types of feedback, such as recasts, may be more effective for errors related to pronunciation or pragmatics.
- b) ***Delayed feedback can still be effective***: While immediate feedback is generally considered more effective, some studies have found that delayed feedback can still be effective, especially when combined with additional opportunities for practice.
- c) ***Learners may not always notice their errors***: Studies have found that learners do not always notice their own errors, especially when they are errors of omission (i.e., leaving out a word or structure). Providing feedback on these types of errors can be particularly effective.
- d) ***Learners benefit from feedback on both correct and incorrect forms***: Studies have found that learners benefit from feedback on both correct and incorrect forms, as it helps them to develop a more accurate representation of the language.
- e) ***Feedback should be tailored to learner needs***: Studies have found that providing feedback that is tailored to learner needs, such as providing more feedback on areas where a learner is struggling, can be more effective than providing feedback in a one-size-fits-all approach.

CONCLUSION

Corrective feedback is an essential aspect of psychology that can help individuals improve their performance and avoid repeating mistakes in the future. While providing effective feedback can be challenging, following best practices can increase the likelihood of success. By providing timely, specific, and actionable feedback in a non-judgmental and objective manner, practitioners can help individuals improve their performance and achieve their goals. Corrective feedback is an essential tool for promoting learning and development in educational settings, but its effectiveness may be limited by various factors. Overuse or misuse of feedback, insufficient or poorly timed feedback, learner factors, and task complexity are some of the reasons why corrective feedback may not be effective or appropriate in certain contexts. To enhance the effectiveness of corrective feedback in experimental research studies, educators can consider strategies such as providing feedback that is specific, timely, and tailored to individual learners' needs and interests. Additionally, feedback should be delivered in a supportive and constructive manner and should be aligned with learners' goals and expectations. Providing opportunities for learners to practice and apply feedback is also important for promoting lasting learning and development. Top of Form

Several researchers have looked at how it affects various factors like learning and motivation. There hasn't been as much research done, though, on how corrective accuracy feedback affects performance on tasks that call for only cognitive-based decision-making. So, the current study focuses on such work. In the study, one way ANOVA, within subject design was used. In a within subject design, the same participants are tested in multiple conditions or levels of an independent variable.

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