

## The Effect of Test Preparation on English Proficiency Performance of English Learners: A Meta-Analysis

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### ABSTRACT

Becoming one of six official United Nations languages, English proficiency has become a prominent requirement for students and professionals entering international education and/or careers, as assessed through standardized English proficiency tests. English learners conducted varied procedures to pursue the minimum test score criteria, including joining an English test preparation program. This study investigates the effect of English test preparation as an intervention on EFL learners' English language proficiency performance by reviewing the effect sizes found by previous studies using meta-analysis of pre-post contrasts. A total of 20 selected studies, according to the criteria determined by researchers between 2018-2021 and conducted in various countries, were collected from Google Scholar sources and included in the research. English language proficiency performance, as indicated by their test scores, is independent of the language skills tested with a p-value of less than 0.05 (p-value = 0.00) and an average weighted effect (M) that appears to be 0.859. This research implies that adequate test preparation is essential for English language learners who wish to achieve the desired level of proficiency. Apart from the ability to write, speak, and read, the psychological aspects of students are also important to prepare before they take the intended test.

### 1. Introduction

Language proficiency is a crucial requirement for persons pursuing educational and professional prospects, both domestically and internationally. Within the vast array of languages spoken globally, English is the primary lingua franca (Julian, 2020; MacKenzie, 2014; Melitz, 2016). Furthermore, it bears the distinction of being officially recognized as one of the languages the United Nations uses, making English proficiency essential to master (Kirkpatrick, 2010; Ruiz, 1984). As a result, the acquisition of English language competency emerges as a necessary condition for facilitating efficient communication, fostering intercultural comprehension, and achieving academic and professional accomplishments. The current urgency has prompted some institutions to implement minimal criteria for English language ability. Nevertheless, the requirements frequently manifest as substantial obstacles for students and professionals (Adam & Magfirah, 2021).

Several studies describe several major obstacles for students and professionals in acquiring English language competence, including (1) linguistic barriers, (2) speech processing difficulties, (3) academic and conversational English skills, (4) speaking confidence, and (5) access to speaking opportunities (Alruzzi et al., 2022; Renandya et al., 2018). Several studies also believe training can improve English language skills (Genesee, 2006; Huang & Flores, 2018; Tannenbaum & Wylie, 2008). English is a skill that can be developed through practice and teaching, and taking a structured learning

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approach can help individuals improve their fluency, pronunciation, grammar, and overall English language proficiency. Furthermore, to effectively navigate the linguistic landscape and meet requirements, English language learners often use various techniques, including engaging in English test preparation programs as a primary approach. However, proper training should be tailored to the English language proficiency test they will take. Each international language proficiency test has different scoring criteria, even though it assesses the same ability level. Further, to effectively navigate the linguistic landscape and meet the requirements, English learner individuals frequently employ diverse techniques, including engaging in English test preparation programs as a major approach.

The current state of standardized assessments for measuring English language competency encompasses a wide range of evaluation instruments designed to meet the needs of a global population. Certain evaluations, particularly those that adhere to the Common European Framework of Reference for Languages, categorize language proficiency into different levels ranging from basic (A1) to advanced (C2) levels (Little, 2006). Among many international English proficiency tests using this framework are the Test of English as a Foreign Language (TOEFL), the Test of English for International Communication (TOEIC), and the International English Language Testing System (IELTS). Even though TOEFL, TOEIC, and IELTS follow the same CEFR framework, these tests have their score range shown in Table 1.

**Table 1**  
*CEFR Levels and the English Proficiency Test Score Range*

CEFR level	English proficiency test score range			
	TOEFL ITP	TOEFL IBT	TOEIC	IELTS
C2	607 – 677	110 – 120	785 – 990	7.5 – 9.0
C1	496 – 603		655 – 780	6.5 – 7.0
B2	417 – 493	87 – 109	555 – 650	5.0 – 6.0
B1	377 – 413	56 – 86	455 – 550	3.5 – 4.5
A2	347 – 373	18 – 55	255 – 450	2.0 – 3.0
A1	310 – 343	0 – 17	0 – 250	0 – 1.5

Table 1 indicates that any English language test students take follows the same European Framework of Reference (CERF). This suggests that if someone has the proficiency level of B2 CEFR in the TOEFL ITP test, they can achieve an IELTS score in the range of 5.0 - 6.0. Several studies suggest the importance of English language training for individuals to achieve scores up to an advanced level to prepare their knowledge and mindset when taking tests (Ariamanesh et al., 2023; Bai & Wang, 2023). Based on this, this research aims to examine the extent of the impact of test preparation on the English language proficiency performance of English learners. Through a meta-analysis of previous research, it is hoped that the study of the influence of test preparation on performance can demonstrate significant effects. This article has two main questions: a) Is there a significant difference between pre-intervention and post-intervention results in studies conducted on preparing tests regarding performance? b) Is there heterogeneity among the observed studies in measuring the pre-post intervention effect regarding test preparation for performance?

## 2. Review of Literature

Different methods can assess language proficiency (Ross, 2005). These methods can be one or a combination of the following: (a) the current usage of language and percentage of time spent speaking the language (De Houwer, 2021); (b) the age at which the individual was first exposed to the language; (c) the overall ability in the language; (d) the ability to understand spoken language; (e) the ability to speak the language; (f) the ability to read written language; (g) the ability to write in the language; (h) the different language registers used, such as basic interpersonal communication skills and cognitive academic language proficiency (Carbonara et al., 2023; Cummins, 2000; Perani et al., 2003). Many established English standardized tests, like TOEFL, TOEIC, and IELTS, combine several methods in assessing the English proficiency level of English learners around the globe. As many higher educational

institutions and professionals require a mastery of English proficiency proven by standardized English test scores, many English learners took a strategy to pursue the minimal score required (Adam & Magfirah, 2021).

The domain of English test preparation comprises a broad range of deliberate interventions to improve test performance. Depending on the skills targeted to enhance, the intervention might vary. Improving reading comprehension can be done through activities like vocabulary building and refining grammar and syntax skills. Listening and speaking skills activities might be in the form of exercises and communication practice. Additionally, writing skills are developed through essay structuring and grammar practice activities. During test preparation, test-takers are also guided on effective time management while exposed to simulated test environments and provided with online resources for practice, ultimately preparing individuals for success in English proficiency tests. The interventions discussed in this context are based on cognitive and noncognitive aspects. They involve various activities that aim to enhance the skills evaluated by the exam, improve techniques for successful test performance, or a mix of both methods (Messick, 1982), and influence learning and performance but are not directly related to intellectual abilities or cognitive processes such as motivation and emotion (Ariamanesh et al., 2023; Zarrei & Rahmaty, 2021). Some ways can be done to increase the score. The six potential test preparation strategies mentioned are getting the correct answers (cheating), taking practice exams, optimizing motivation, managing test anxiety, improving test wiseness, and teaching test material. These elements cover cognitive and noncognitive components of test preparation and encompass various activities test-takers can engage in (Wigdor, 1982).

After analyzing these strategies, it becomes apparent that test preparation can be classified into three, each with its instructional focus. These include (a) a test-taking orientation, which aims to familiarize candidates with the testing process to reduce anxiety and enhance comfort levels; (b) coaching, which entails intensive and targeted practice using similar item formats, often facilitated by commercial entities or educational institutions; and (c) instruction that imparts skills that are applicable beyond the context of the test (Bransford et al., 1986). Every classification of test preparation possesses its advantages and disadvantages in terms of its effectiveness in improving scores on English proficiency tests

The available literature emphasizes the effectiveness of test preparation programs in enhancing the performance of individuals taking different English proficiency examinations. Numerous scholarly investigations have been conducted to explore the impact of test preparation programs on assessments such as the TOEFL ITP and TOEFL iBT (Adam & Magfirah, 2021; Alotumi, 2018; Amnan, 2021; Djamereng et al., 2021; Ghaemi & Houshangi, 2021) showing a positive effect on English learners overall score. Some studies were also done focusing on TOEIC (Daniel & Christopher, 2018; Maliwan, 2018) and IELTS (Dang & Dang, 2023; Firoozjahantigh et al., 2021; Goncharov, 2019; Harnila, 2018; Perbowo et al., 2019; Rezai, 2022; Sabzian et al., 2019; Tieu & Baker, 2023) which mostly also proved the intervention brought positive effect in general. Those experiments were conducted across various demographic groups and geographical locations. They consistently showed beneficial benefits in terms of improving participants' test scores. Furthermore, concerning meta-analysis studies investigating the effect of standardized assessment, a collection of meta-analyses has examined the influence of test preparation on standardized evaluations such as the SAT (Briggs, 2005; DerSimonian & Laird, 2012; Firmansyah et al., 2022). Nevertheless, there is a notable study gap regarding the impact of English test preparation programs on English proficiency tests using meta-analysis.

The study aims to explore whether English test preparation programs can lead to significant improvements in the English proficiency test scores of participants, regardless of the specific tests and other demographic factors of the English learners. A comprehensive meta-analysis will accomplish this. By thoroughly examining the effect sizes obtained from average pre- and post-intervention scores in the context of English proficiency tests, this study intends to prove such intervention leads to positive results in English proficiency test scores of English learners. Through synthesizing and conducting a rigorous analysis of the current body of research, this study is expected to provide a significant and original contribution to the field of language education, specifically related to English proficiency (Cummins, 2000). The insights from grounded empirical data can serve as valuable guidance for educators, learners, and policymakers.

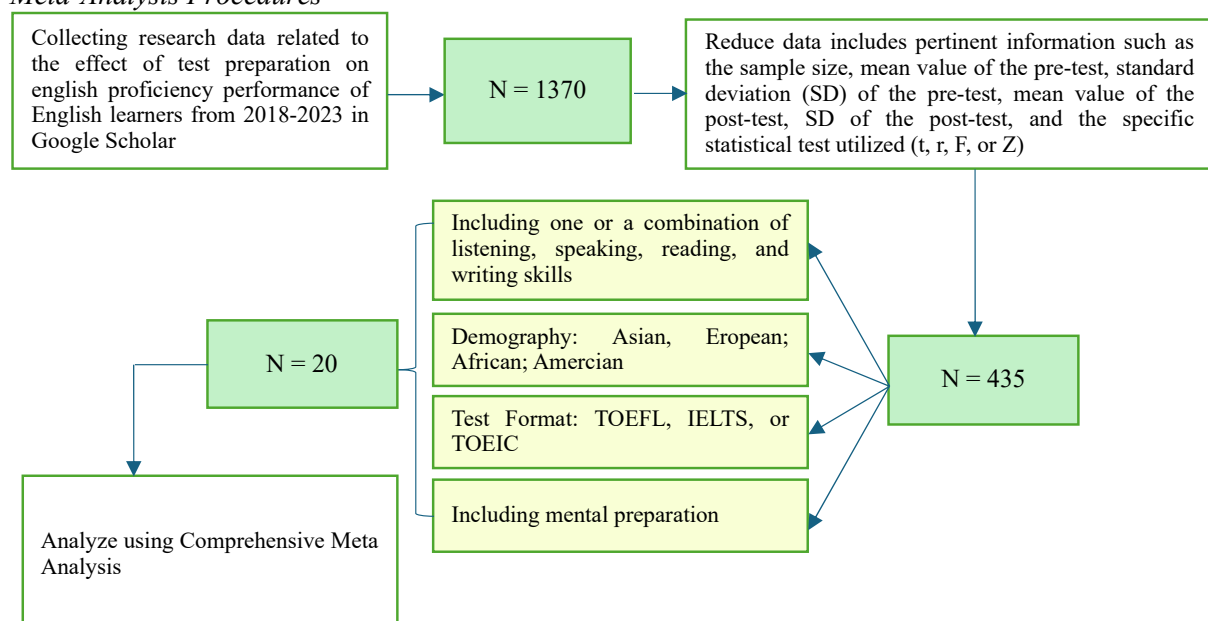
### 3. Method

The method used in this research is a quantitative method through meta-analysis. Meta-analysis provides a technique for integrating findings from various investigations into a uniform scale, augmenting the outcomes' dependability and applicability (Borenstein et al., 2021). Meta-analysis is a method that enables the integration of diverse statistical measures, such as means, correlations, and variances, by transforming them onto a standardized scale (Firmansyah et al., 2022; Hedges & Olkin, 2014; Lipsey & Wilson, 2001). This standardization process allows for a unified and coherent interpretation of the combined data. This study uses the pre-post score contrast, one of the various types of effect size statistics.

#### 3.1. Procedures

Rigorous inclusion criteria were created to enhance the data's representativeness and ensure the cerate's trustworthiness. To be considered eligible for inclusion, studies had to meet the following requirements: a) the English proficiency scores were obtained both before and after the preparation period, b) the tests employed globally acknowledged assessments of English language skills, such as TOEFL, IELTS, or TOEIC) the publications under consideration were released over the period spanning from 2018 to 2021; and d) the statistical data provided includes pertinent information such as the sample size, mean value of the pre-test, standard deviation (SD) of the pre-test, mean value of the post-test, SD of the post-test, and the specific statistical test utilized (t, r, F, or Z). A literature search involves systematically exploring and reviewing existing scholarly sources to get relevant information and insights on a particular topic. A systematic search on the Google Scholar website initiated the investigation into prospective empirical research. Upon conducting an initial search using the terms 'IELTS preparation', 'TOEFL preparation', 'score', and 'improvement', a total of 1370 results were obtained. The publication date filter was adjusted to include just those articles published from 2018 to 2021 to narrow the results to more current studies. Following a meticulous examination to ascertain compliance with the predetermined criteria for inclusion, the total count of studies was reduced to 435. From this, some research employed a qualitative methodology or failed to meet the quantitative criteria established for this study, resulting in their elimination. After thoroughly selecting, finalists were identified as suitable candidates for inclusion in this meta-analysis.

**Figure 1.**  
*Meta-Analysis Procedures*



### 3.2. Analysis

The fundamental aspect of the meta-analysis entailed the statistical integration of the quantitative results from the chosen research, wherein various outcome measures were converted into a standardized scale to facilitate collective analysis. By statistically integrating the quantitative findings of the prior study, meta-analysis can be utilized as a secondary analysis to provide new information. The multiple outcome measures are transformed into a common standard scale to be merged for analysis as the core of the meta-analysis. The findings from each study were transformed into standard effect sizes to enable comparison across studies. Effect sizes were calculated using several measurement scales to facilitate direct comparisons between trials. The effect sizes mentioned in the statement are indices independent of scale. These indices play a crucial role in enabling meaningful and relevant statistical integration. The analysis used the Comprehensive Meta-Analysis ver. 3 program.

This study primarily emphasizes the pre-post score contrast, one of the various types of effect size statistics—central tendencies, pre-post contrasts, group contrasts, and relationships between variables. The primary objective of this study is to ascertain the magnitude of the impact on participants' English language proficiency scores before and after their engagement in test preparation programs. The English proficiency tests measure English learners' language proficiency through their overall ability in the language, including one or a combination of listening, speaking, reading, and writing skills. Test scores were modified to standard scores to account for differences in assessment scales between various English language proficiency assessments before analysis. The investigation encompassed many statistical techniques to evaluate publication bias and heterogeneity, such as Fixed Effect tests, forest plots, funnel plots, Begg and Mazumdar rank correlation tests, Egger's regression test, and Duval and Tweedie tests. By utilizing meta-analysis to generate valuable insights into the effects of English test preparation on English proficiency performance, this study expects to be able to facilitate evidence-based decision-making in the field of language education.

The testing procedure is carried out to measure the effect size (d) by calculating the difference between the scores obtained from the pre and post-tests in the involved articles. The standardized mean difference calculates the effect size (d).

$$d = \frac{\overline{Y}_{diff}}{S_{within}} = \frac{\overline{Y}_1 - \overline{Y}_2}{S_{within}} \dots\dots\dots (1)$$

with

$$S_{within} = \sqrt{\frac{S_{diff}}{2(1-r)}} \dots\dots\dots (2)$$

*description:*

*d = effect size*

*$\overline{Y}_1 - \overline{Y}_2$  = mean score pre-post test*

*$S_{within}$  = Deviation Standard within the group*

*$S_{diff}$  = Deviation Standard from score difference*

*r = correlation pre-post test*

## 4. Results and Discussion

### 4.1. Result

The initial search resulted in the identification of 1370 possible studies from multiple databases. After applying modified criteria, which involved reviewing publications between 2018 and 2021, 435 studies fulfilled the specified requirements. A comprehensive study of these investigations revealed that 20 papers fulfilled all the inclusion requirements, serving as the foundation for the meta-analysis. The 20 chosen studies exhibited variations in geographical location, sample characteristics, and the specific English proficiency tests examined. The studies together encompassed a wide variety of English proficiency assessment formats, such as the Test of English as a Foreign Language (TOEFL), the International English Language Testing System (IELTS), and the Test of English for International Communication (TOEIC). The test preparation programs varied significantly regarding the interventions' duration, substance, and delivery methods. A fixed effect analysis was done to see the descriptive statistics of the model, the output of which can be seen in Table 2.

**Table 2.**  
*Fixed Effect Model Result*

Statistics	CMA Result
Mean effect	.859
Variance	.029
Standard error	.172
Lower	.844
Upper	1.44
z for the test of the null	21.8
p-value (1-tailed)	.000
p-value (2-tailed)	.000

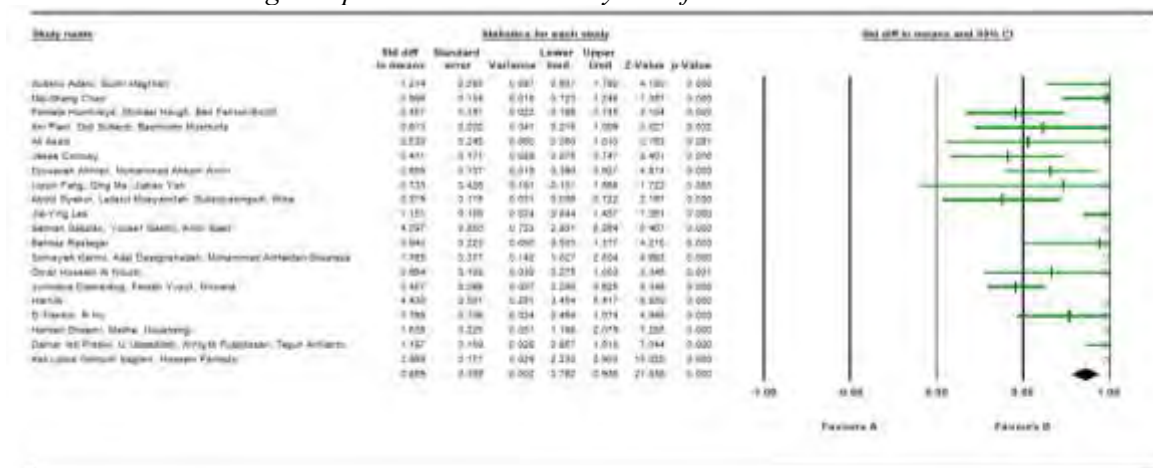
By utilizing the Fixed Effect (FE) model for the investigation, the calculated average weighted effect (M) emerged as 0.859. The observed number suggests a noticeable disparity between the scores obtained in the post-test and pre-test, indicating a positive change of 0.859 in the post-test scores relative to the pre-test results. Significantly, this notable disparity highlights the fact that the post-test scores of the individuals exceed their pre-test performance. Further, to test whether the difference is significant, the Z test was done using the hypothesis as follows:

$$H_0 = \text{true effect size } (\theta) = 0$$

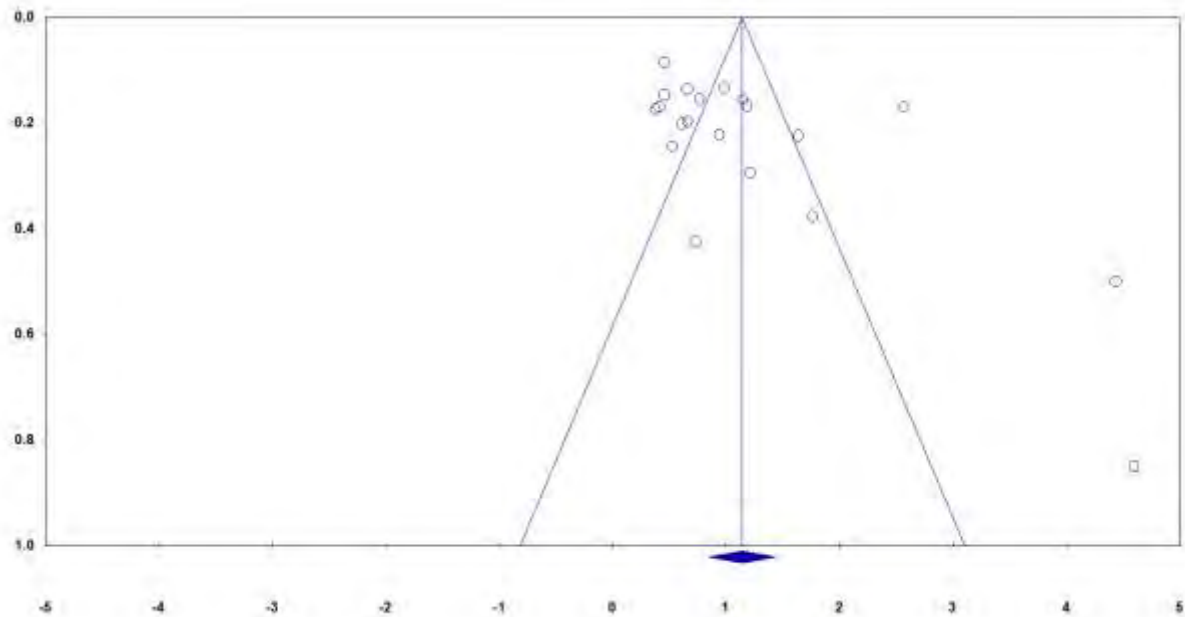
$$H_1 = \text{true effect size } (\theta) \neq 0$$

The obtained Z value of 21.8, along with a p-value (one-tailed and two-tailed) less than 0.05, highlights the statistical importance of the findings. The null hypothesis (H0) is rejected, indicating that the true effect magnitude is not equivalent to zero. This discovery proves that individuals who participated in English test preparation programs experienced notable enhancements in their results, based on scholarly research articles published from 2018 to 2021. The overall effect of test preparation on participants' English proficiency scores can also be seen from the forest plot shown in Figure 2.

**Figure 2.**  
*Forest Plot Result Using Comprehensive Meta-Analysis Software*



The funnel plot demonstrated a predominantly symmetrical dispersion of effect estimates, most concentrated around the middle line. The absence of bias was further validated by utilizing the Begg and Mazumdar rank correlation test for additional examination.

**Figure 3.***Funnel Plot Result Using Comprehensive Meta-Analysis Software*

The rank correlation test encompasses the Begg and Mazumdar test, which examines the correlation between the ranks of effect sizes and the ranks of their corresponding variances. The findings in Table 3 indicate that the reported p-values of less than 0.05 (0.02) support the rejection of the null hypothesis and suggest the lack of bias. The discussion should not repeat the results but provide a detailed interpretation of the data. This should interpret the significance of the findings of the work. Citations should be given in support of the findings. The results and discussion can also be described as separate, if appropriate.

**Table 3***Begg and Mazumdar Rank Correlation.*

Statistics	Result
Kendall's S statistic (P-Q)	72.0
Kendall's tau without continuity correction	
tau	.379
z-value for tau	2.34
p-value (1-tailed)	.001
p-value (2-tailed)	.019
Kendall's tau with continuity correction	
tau	.374
z-value for tau	2.30
p-value (1-tailed)	.010
p-value (2-tailed)	.021

The asymmetry test utilizing Egger's regression test indicated a lack of statistically significant asymmetry. The statistical significance of the p-value, as seen in Table 4, being more significant than 0.05, together with a minor standard deviation in the intercept, supports a balanced distribution of effect sizes and variances. This strengthens the overall dependability of the research findings. The Duval and Tweedie test, which includes the trim and fill approach, was employed to examine the potential existence of missing studies through the iterative adjustment of effect sizes. In this process, the effect

sizes of the studies included in the analysis will be adjusted iteratively to account for the absence of missing studies. This method aims to obtain a more accurate estimate of the true effect size by taking into account the potential influence of unpublished studies.

**Table 4***Egger's Regression Intercept*

Statistics	Result
Intercept	4.61
Standard error	1.74
95% lower limit (2-tailed)	.945
95% upper limit (2-tailed)	8.27
t-value	2.64
df	18.0
p-value (1-tailed)	.008
p-value (2-tailed)	.017

Table 5 demonstrates that no research necessitated cutting to achieve symmetry, so the consistency and comprehensiveness of the dataset are confirmed. Overall, applying the Fixed Effect model yielded a noticeable mean weighted effect size of 0.859, suggesting the efficacy of English test preparation programs in improving the English language ability of participants. The observed enhancements exhibited statistical significance as determined by the results of the Z-test. The utilization of the forest plot, funnel plot, and other bias evaluation approaches collectively strengthen the coherence and dependability of these findings, providing insight into the favorable influence of test preparation on language proficiency outcomes.

**Table 5***Duval and Tweedie's Trim and Fill*

Statistics	Observed values	Adjusted values
	<i>Fixed Effects</i>	
Point Estimate	.858	.859
Lower Limit	.782	.782
Upper Limit	.782	.782
	<i>Random Effect</i>	
Point Estimate	1.14	1.14
Lower Limit	.845	.845
Upper Limit	1.44	1.44
Q Value	248.5	248.5

**4.2. Discussion**

The demand for English language ability has experienced a significant increase in the global landscape of academia and professional communication. The increased importance of standardized English proficiency tests, such as TOEFL, IELTS, and TOEIC, has generated a notable level of interest in the effectiveness of test preparation programs designed to improve success in these exams (Riswandi & Wahyudi, 2018; Sabzian et al., 2019; Yu & Green, 2021). Our meta-analysis makes a valuable contribution to the existing body of literature by examining the effects of test preparation on English proficiency achievement through English learners' overall ability in the language, including one or a combination of listening, speaking, reading, and writing skills. This study goes beyond the limitations of focusing on specific language skills, test formats, demographic variables, and program features. With a more holistic approach, this research tries to dive deeper into broader aspects, such as social, psychological, and cultural contexts that may influence test results and language learning. Thus, this research seeks to provide a more comprehensive and in-depth picture of the dynamics behind language evaluation skills and efforts to increase the effectiveness of learning programs. The topic of test preparation programs in language assessment has sparked much scholarly discussion. The present meta-



analysis unequivocally confirms the beneficial impact of these programs on the language competence test scores of individuals included. The calculated mean effect size (M value) of 0.859 is strong evidence of the improvement, indicating a significant increase in post-test scores compared to pre-test levels. Supporting this discovery, the corresponding Z value of 21.839 amplifies the statistical significance of the enhancement, clearly suggesting that individuals who participate in English test preparation programs achieve significantly higher results on English proficiency tests, regardless of their English skills.

Our investigation has uncovered a captivating revelation: all studies in the forest plot consistently demonstrate a positive direction. The consistent increase in post-test results provides strong evidence for the effectiveness of test preparation programs, regardless of the English proficiency exam and English skills being tested. This significant discovery highlights that the benefits of test preparation extend beyond a specific form of evaluation, increasing the applicability of the observed impact (Li, 2021; Liu, 2014). Equally significant is the finding that test preparation programs have a positive effect that transcends demographic characteristics. Variables that could influence outcomes include the participant's place of origin, age, level of education, learning modalities utilized, and the program duration. Nevertheless, our meta-analysis reveals that the favorable influence stays consistent across these dimensions. The inclusive impact indicates that test preparation programs have advantages that extend beyond particular groups or situations, making them adaptable interventions that can accommodate a wide range of learners.

In the middle of the consistently favorable results, a subset of studies (specifically, four out of the 20) exhibit effect sizes that are less than 0.50 (Figure 2). Despite attempts to consider multiple variables such as test format, characteristics of participants, and program attributes, the fundamental reasons behind the somewhat diminished impact of these effects are still unknown. This incongruity prompts additional investigation into the complex relationship between test preparation and language competence results. The intricate nature of this dynamic highlights the imperative need for focused research to elucidate the fundamental processes that contribute to these discrepancies. Our meta-analysis incorporates a range of analytical approaches to increase the reliability of our findings and reduce the potential for bias. The funnel plot and the Begg and Mazumdar rank correlation test present a reliable approach for evaluating the distribution and potential bias within the chosen research. In addition, the regression intercept proposed by Egger can be utilized as a valuable method for detecting any publication bias, enhancing the dependability of the synthesis findings. Using multidimensional methodologies in our research collectively enhances methodological rigor, reinforcing the integrity of the included studies.

The Duval and Tweedie trim-and-fill study is the pivotal component in confirming the consistency of our results, marking the culmination of our analysis. By incorporating hypothetical examples not included in the analysis, this study strengthens the argument that test preparation has a consistent and long-lasting favorable impact on English proficiency results. The implications of our meta-analysis extend beyond the realm of academia, influencing educational policies and practices. Educators and institutions can utilize these findings to guide the development and implementation of evidence-based test preparation programs (Alavi et al., 2018; Dang & Dang, 2023). Our meta-analysis holds a significant role in the continuing discussion over the relationship between test preparation programs and success in English proficiency, seen from overall/one/a combination of specific language skills. The synthesis of data from a wide array of studies ultimately leads to a strong confirmation of the positive effects of these interventions. The consistent increase in post-test scores, unaffected by variations in test formats, demographic factors, and program characteristics, highlights the effectiveness of test preparation programs. The thorough examination of bias, distribution, and consistency enhances the reliability of the results, positioning our meta-analysis as an essential resource for researchers, educators, and policymakers alike. In conclusion, this synthesis expands knowledge regarding the relationship between test preparation and language proficiency results. It promotes the development of informed teaching methods and provides a foundation for future research in English language assessment.

The meta-analysis results indicate that English language test preparation significantly affects learners' English language proficiency performance. Many English proficiency tests, such as TOEFL or IELTS, have specific formats, types of questions, and time constraints. Engaging in test preparation

helps learners become familiar with these aspects, reducing anxiety and boosting confidence on test day. Test preparation enables learners to understand the content areas covered in the exam. This includes grammar rules, vocabulary, reading comprehension strategies, listening skills, and writing techniques. Learners can strengthen their skills and knowledge base by focusing on these areas during preparation. Some research findings reveal that thorough preparation enhances their performance and boosts their confidence and readiness to communicate effectively in English across various academic and professional environments.

## 5. Conclusion

The meta-analysis results emphasize the importance of English test preparation programs in improving participants' English proficiency levels. This underscores that investment in such programs can significantly affect participants' English proficiency, regardless of the test used or participants' demographic characteristics. The English test preparation program improves participants' English skills, performance, and confidence in communicating effectively in English in various academic and professional environments. Although the results show improvements in participants' English proficiency, this meta-analysis highlights uncovered complexities in measuring English competency. This suggests that psychological aspects must be considered to understand better the impact of English test preparation programs on participants. One of the main implications is the need for further research in psychology to understand the psychological changes that may occur in participants during the pre-test and post-test stages. Such research could provide new insight into whether these psychological changes substantially affect overall test performance. This meta-analysis suggests an opportunity for future research in exploring unexplored areas, particularly in understanding the psychological impact of English test preparation programs. This highlights the need to continually expand our knowledge of how best to prepare participants for English tests and its impact on their performance.

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