
RESEARCH ARTICLE

Exploring the Effect of Language-related Academic Emotions on Foreign Language Achievement: A Systematic Review and Meta Analysis

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ABSTRACT

Language-related academic emotions, especially foreign language anxiety (FLA) and foreign language enjoyment (FLE) have been widely explored, and foreign language boredom (FLB) has gradually attracted more and more attention. Previous research has examined the relationship between language-related academic emotions (FLE, FLA, and FLB) and language performance, but the findings have been inconsistent. By synthesizing the existing literature, we aim to provide a clearer understanding of the relationship between these emotions and language performance. Thirty-nine studies with 130 independent samples from 9 countries and 91,405 participants were included in our meta-analysis. The results show that FLE has a positive impact on foreign language achievement ($r=0.339$), while FLA and FLB have negative impacts ($r=-0.259$ and $r=-0.288$, respectively). FLE emerges as the most significant factor affecting foreign language achievement. Subgroup analyses and meta-regression analysis were performed to examine potential moderators, revealing that age and linguistic differences do not have a significant impact on this relationship, but education level and the type of achievement measure play a crucial role in mediating the effects of FLE and FLA on language achievement. The findings provide evidence for the effectiveness of language-related emotions on language achievement and have important implications for language learning research and practice.

KEYWORDS

Foreign Language Enjoyment; Foreign Language Boredom, Foreign Language Anxiety. Academic Achievement, Meta-Analysis

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1. Introduction

The complex interplay between cognitive abilities and affective factors has long been a subject of interest in the field of language acquisition. In recent years, academic or achievement emotions, defined as emotions closely tied to achievement activities or outcomes (Pekrun, 2006), have gained significant attention due to their profound impact on second language acquisition (SLA) (Oyama, 2022; Tahmouresi & Papi, 2021). Within this realm, research has historically focused on anxiety, but recent studies have shifted towards exploring the role of positive emotions, guided by the broaden-and-build theory of positive psychology (Fredrickson, 2001) and its implications for language learning attainment (Kruk et al., 2022; Li & Wei, 2023). Despite this shift, there remains a lack of research that comprehensively examines a range of emotions in comparison to other subject domains like mathematics and science, which have extensively covered various emotional aspects (Shao et al., 2020).

Recently, researchers have turned their attention to academic emotions pertinent to foreign language (FL), particularly Foreign Language Enjoyment (FLE), Foreign Language Anxiety (FLA), and Foreign Language Boredom (FLB). These emotions have garnered widespread interest, leading to a steady flow of research on their impact on language performance. However, inconsistent findings have emerged from these studies, with some studies suggesting that FLE, FLA, and FLB significantly influence educational outcomes, either positively or negatively, as highlighted by Dewaele and Li (2022), while others argue that foreign language

emotions like FLE do not have a significant impact on language performance (Badiei et al., 2023). Moreover, there is a lack of consensus regarding the primary emotions influencing foreign language achievement.

To address these gaps and provide a comprehensive analysis, a meta-analysis is necessary. Meta-analysis is a research methodology that combines and synthesizes data from multiple studies to examine the relationship between variables systematically (Glass, 1976). In this study, we will conduct a meticulous and quantitative meta-analysis to explore the relationship between emotions related to language and SLA achievement. Moreover, we aim to investigate potential moderator variables that may explain the observed disparities in correlations reported within the existing literature. The study will begin by clarifying the key terms and concepts, such as FLE, FLA, and FLB, and reviewing research on the relationship between foreign language emotions and language performance, followed by a detailed description of the meta-analysis methodology, including study selection criteria, data extraction methods, and statistical analysis techniques. Finally, we will summarize the key findings of the meta-analysis and explore their significance for SLA research and educational practices.

2. Literature Review

2.1 FLE, FLA and FLB

Language-related academic emotions encompass positive emotions, such as FLE, as well as negative emotions, such as FLA and FLB. FLE is defined as the broad spectrum of positive emotions felt by FL learners when their psychological necessities are met within the FL classroom (Botes et al., 2021). Generally, FLE is made up of three dimensions: private enjoyment, social enjoyment and teacher enjoyment (Dewaele & Li, 2021; Dewaele & Macintyre, 2016; Li et al., 2018). On the other hand, foreign language classroom anxiety (FLCA), or FLA in this study, was the first to be proposed as a more situation-specific understanding of anxiety, defined as “a distinct complex of self-perceptions, beliefs, feelings, and behaviors related to classroom language learning arising from the uniqueness of the language learning process” (Horwitz et al., 1986, p. 128). FLB, a recently recognized emotion, was conceptualized as a three-dimensional achievement emotion, encompassing a range of negative feelings and symptoms, including inattention, disengagement, and desire to escape (Li et al., 2021). More specifically, it is characterized as a negative emotional state with a low level of activation or arousal, typically triggered by activities that are either overly demanding, insufficiently challenging, or lack significant relevance or meaning for the learner (Li et al., 2023).

FLE and FLA tend to have a negative correlation, indicating that when learners enjoy the journey of acquiring language skills, they tend to experience less anxiety (Chen et al., 2023; Tsang & Dewaele, 2023). On the other hand, FLE is negatively associated with FLB (J. M. Dewaele et al., 2023; Tsang & Dewaele, 2023; Wang et al., 2023), whereas there is a positive correlation between FLA and FLB (Zhao & Wang, 2023). However, the relationship between FLA, FLE, and FLB is not static but complex and dynamic, varying according to the nature of the learning tasks (Bielak, 2022; Wang et al., 2023).

Various learner-internal and learner-external variables have been examined as sources of FLE, FLA, or FLB. When it comes to the source of FLE, internal factors such as learners' attitudes towards the foreign language (J. M. Dewaele et al., 2023), personality traits (Dewaele & MacIntyre, 2019), emotional intelligence (Li, 2020), grit (Badiei et al., 2023; Choi & Lee, 2023; Khajavy & Aghaee, 2022), control and value appraisal (Shao et al., 2020; Zhao & Wang, 2023), and ideal L2 self (Kim, 2023; Liu et al., 2022) have been linked to FLE. Demographic variables, including age (Tsang & Dewaele, 2023), gender (Ismail, 2015; Ma et al., 2023), and multilingualism (Dewaele & MacIntyre, 2014) have also been associated with FLE. Teacher behaviors, including consistency in using the foreign language and the degree of unpredictability, have been identified as external factors that significantly impact Foreign Language Enjoyment (FLE), according to J. M. Dewaele et al. (2023). FLA has been related to learner-external variables such as urban-rural environment (Ma et al., 2023) and linguistic distance between the target language and L1 (Dewaele & MacIntyre, 2014). However, FLA, a more trait-like emotion, has been more linked to a number of learner variables, in contrast to the more state-like FLE, which is more related to teacher-related variables (Dewaele & MacIntyre, 2019; Dewaele & Dewaele, 2020). FLB is also influenced by both learner-internal and learner-external variables. For example, teacher-related factors, such as instruction approach and excessive repetition, can decrease learners' willingness to communicate, leading to lower oral proficiency (Kruk et al., 2022; Li et al., 2021). Other external factors include teacher enthusiasm, frequent use of a foreign language, and teacher unpredictability (Dewaele & Li, 2021) (Dewaele et al., 2023a).

In summary, a wide range of learner-internal and learner-external variables contribute to FLE, FLA, and FLB, highlighting the complexity of these constructs and the need for a multifaceted approach in language education. However, currently, the existing studies on FLA, FLE, and FLB often focus on each construct separately, neglecting the intricate interrelationships among them. This approach fails to capture the holistic picture of language learners' emotional and cognitive experiences. Additionally, there is a limited understanding of the intricate relationships between internal and external variables that affect FLA, FLE, and FLB. To address these limitations, our study aims to simultaneously investigate FLA, FLE, and FLB, providing a more comprehensive understanding of language learners' emotional and cognitive landscapes.

2.2 The Relationship between FL Emotions and FL Performance

Many prior studies have looked into FLA, FLE, and FLB as predictors of FL proficiency. FL proficiency is typically gauged through individuals' subjective perception of their abilities coupled with objective measures like grades, test outcomes, or overall indicators of their language proficiency (Botes et al., 2022; Dewaele & MacIntyre, 2014).

Generally, FL achievement is positively predicted by FLE, whereas it is negatively predicted by both FLA and FLB (Chou, 2021). The same result can be found in different countries. For example, in Iran, Hamedei et al. (2020) found that enjoyment positively influenced learners' reading engagement and comprehension, while anxiety and boredom had a negative impact. Similarly, studies in France and China showed that positive emotions, including FLE, enhanced academic motivation and achievement, whereas FLA and FLB had adverse effects (Ma et al., 2023; Méndez-Aguado et al., 2020).

However, there are mixed results on the effect of FLA, FLB, and FLE on FL performance. For example, Dewaele et al. (2023) conducted a survey among FL learners across the globe studying a wide array of foreign languages. Their structural equation model analysis revealed that FLCA was the only factor that had a negative correlation with academic performance. In contrast, Ismail's (2015) findings indicated that certain academic emotions, including positive ones like enjoyment and pride and negative ones like shame and hopelessness, were predictive of students' English achievement, while FLA and FLB did not significantly contribute to this prediction. On the other hand, FLA does not exclusively play a negative role. Empirical studies indicate that there are two different types of anxiety-debilitating anxiety and facilitating anxiety (Dörnyei, 2005). Facilitating anxiety is possible to generate as long as it is adaptive and harmonious with FLE. It urges learners to take action and narrow the distance between their actual proficiency and ideal target, contributing to the success of language learning as FLE does (Dewaele & MacIntyre, 2014). For instance, Ma et al. (2023) reveal in their study that anxiety at an optimal level - one that encourages motivation, focus, and meticulous attention - turned out to be a positive predictor of performance among both rural and urban students.

On the other hand, though numerous research agrees on the positive effect of FLE and the negative influence of FLA and FLB, there remains a debate regarding the relative predictive power of these emotions. J.-M. Dewaele et al. (2023) demonstrated that FLA had the most significant negative impact on language achievement, followed by FLB, with FLE exerting a less prominent positive influence. In contrast, Ma et al. (2023) observed a weakly positive correlation between anxiety and language achievement among rural students, suggesting a more nuanced relationship. Li, Wei, et al. (2023) further complicated the picture by finding boredom to have a stronger negative impact on writing achievement than anxiety. Furthermore, Wang et al. (2023) pointed out that when combined with other emotions, FLB did not significantly affect English achievement. Moreover, despite the dominance of negative emotions in some studies, Tsang and Dewaele (2023) found FLE to be the most enduring predictor of engagement and proficiency among EFL children in Hong Kong. This was further corroborated by Li and Wei (2023), who, through a longitudinal study, confirmed FLE's lasting influence on foreign language test results.

To delve deeper into the inconsistency of research results regarding the impact of emotions on foreign language learning, our meta-analysis aims to synthesize and compare the findings of various studies, taking into account different sample sizes, methodologies, and cultural contexts. By pooling data from multiple studies, we are able to gain a more comprehensive understanding of the relationship between these emotions and language learning outcomes and assess the strength of these effects.

2.3 The Moderators of FL Emotions and FL Performance

The inconsistent results observed across various studies regarding the correlation between foreign language emotions and FL achievements can be attributed to the influence of moderator variables (Teimouri et al., 2019). A meta-analysis conducted by Botes et al. (2022) on FLE has identified key moderators that include demographic factors, such as gender, average age, and nationality, as well as the linguistic distance between the first language and the target language. Notably, the study revealed that while average age serves as a moderator in the association between FLE and self-evaluated achievement, no moderators were found to significantly impact the correlation between FLE and academic performance. This suggests that while individual demographic characteristics may influence how students perceive their own linguistic abilities, they do not necessarily affect objective measures of academic success.

Building on the findings of other meta-analyses on FLA, Teimouri et al. (2019) further explored the influence of contextual and language-related factors on the relationship between students' anxiety and their language achievement. Their analysis took into account various achievement measures, educational levels, types of anxiety (such as writing, reading, listening, and speaking anxiety), and the target language being studied (English and non-English languages). The results indicated that the negative effect of anxiety varies across these different dimensions, underscoring the complexity of the moderators involved. Given the complexity and nuance of these moderators, this study aims to delve into the mediate effect on the relationship between language related

emotion and FL achievement. Taken together, the moderators can include average age, linguistic distance, educational level, types of emotions, and language achievement measures.

2.4 Objectives of the Current Study

Not until the recent decade did the SLA make a pivotal shift to comprehensively study foreign language emotions. Prior to this period, research had primarily focused on a specific emotion separately, particularly anxiety or enjoyment, with a notable absence of integrated investigations, including multiple positive and negative emotions. Therefore, the first goal of this study is to develop a more holistic understanding of the emotional landscape in foreign language learning by investigating FLA, FLE, and FLB together. Secondly, the three emotions have yielded inconsistent educational outcomes in different contexts. Thus, we must delve into the linkage between FLA, FLE, and FLB and how they correlate with FL achievement. The assumption that positive emotions invariably produce favorable educational results and negative emotions invariably lead to negative ones is not necessarily accurate. It is also crucial to identify the emotions or combinations of emotions that have the greatest impact on FL achievement, which can give us pedagogical implications for foreign language teaching. Thirdly, moderators play a significant role in the mixed results observed in the correlation between emotions and FL achievement. The objective of this study is to ascertain the influence of various contextual and language-related factors that may serve as moderators in the relationship between FLA, FLE and FLB and their linguistic achievement. To avoid confusion, one of the moderator moderators- 'emotion types' in Teimouri et al.'s (2019) meta analysis, is renamed as " language domain" in this study to underscore the relation between different emotions on general language achievement or specific language performance. Keeping these objectives in focus, we strive to address the following research questions:

RQ1: What is the nature (positive or negative) and magnitude of the correlation between foreign language emotions (specifically FLA, FLB, and FLE) and learners' language achievement?

RQ2: To what extent do demographic variables (including age), linguistic distance, educational level, language domain, and the methods of measuring achievement moderate the relationship between FL emotions and language achievement?

3. Method

3.1 Literature Search

In March 2024, a comprehensive search was conducted across four databases: Web of Science, ERIC, psychARTICLES, and Google Scholar, employing a variety of key terms, including 'emotions' or 'achievement emotions', 'second language' or 'foreign language', and 'proficiency', 'performance', or 'achievement'. Only studies written in English were taken into account. Furthermore, we conducted citation tracking, both backwards and forward, based on key and recent articles. In total, up to March 7th, 2024, our search yielded 478 documents related to the relationship between language-specific academic emotions and FL achievement, duplicates included.

3.2 Inclusion/Exclusion Strategy

For the purpose of examining the relevance of a study to the issues we are investigating and its eligibility for inclusion in our meta-analysis, we carefully examined the title and abstract of each research study and applied four eligibility criteria for selection. First, a study must be an empirical research in the realm of foreign languages, particularly focusing on the correlation between academic emotions (especially FLA, FLE, and FLB) and language achievement. Second, a study must report the correlation between language emotions and language achievement, either as a Pearson correlation coefficient (r) or another comparable statistic, such as t or F , that can be converted to a correlation. However, studies primarily utilizing multiple structural equation modeling or regression analyses are ineligible unless they also provide the correlation matrices used in their analysis (Teimouri et al., 2019). Third, the study included in the meta analysis must contain an overall sample. Fourth, the investigation centers on students' academic emotions within a traditional teaching environment, excluding any research conducted in online settings. After filtering our initial search results based on the eligibility criteria, a final pool of 39 reports with $k=130$ effect sizes (enjoyment=57; anxiety=47; boredom=26) and a sample of 91,405 participants was retained for further analysis. The specific screening process for selecting relevant studies is outlined in Figure 1.

3.3 Coding Procedure

To establish a solid foundation for the meta-analysis, a comprehensive coding strategy was employed to capture numerous characteristics from the 39 selected articles. The coding process was designed to ensure consistency, reliability, and reproducibility. First of all, publication information (author, year of publication) was recorded for each study, which is crucial for tracing the source of the studies and ensuring the accuracy of the data extracted. Second, the demographic characteristics of each study were carefully noted. These included the sample size, gender distribution, average age, and country. Third, language achievement can be evaluated through different skills and assessments; it is essential to capture this information accurately. We record the specific language achievement measures, including but not limited to listening, speaking, writing, reading, vocabulary, and grammar. This allows us to compare and contrast the methodologies used across studies and assess their impact on the findings. Fourth, Pearson's

correlation coefficient (r) of each study was recorded to measure the strength and direction of the relationship between FLA/FLE/FLB and FL achievement. Fifth, according to Botes et al. (2022), the quantitative linguistic distance measure outlined by Chiswick and Miller (2004) was utilized to code the linguistic distance, which was measured on a scale from 0 to 1.

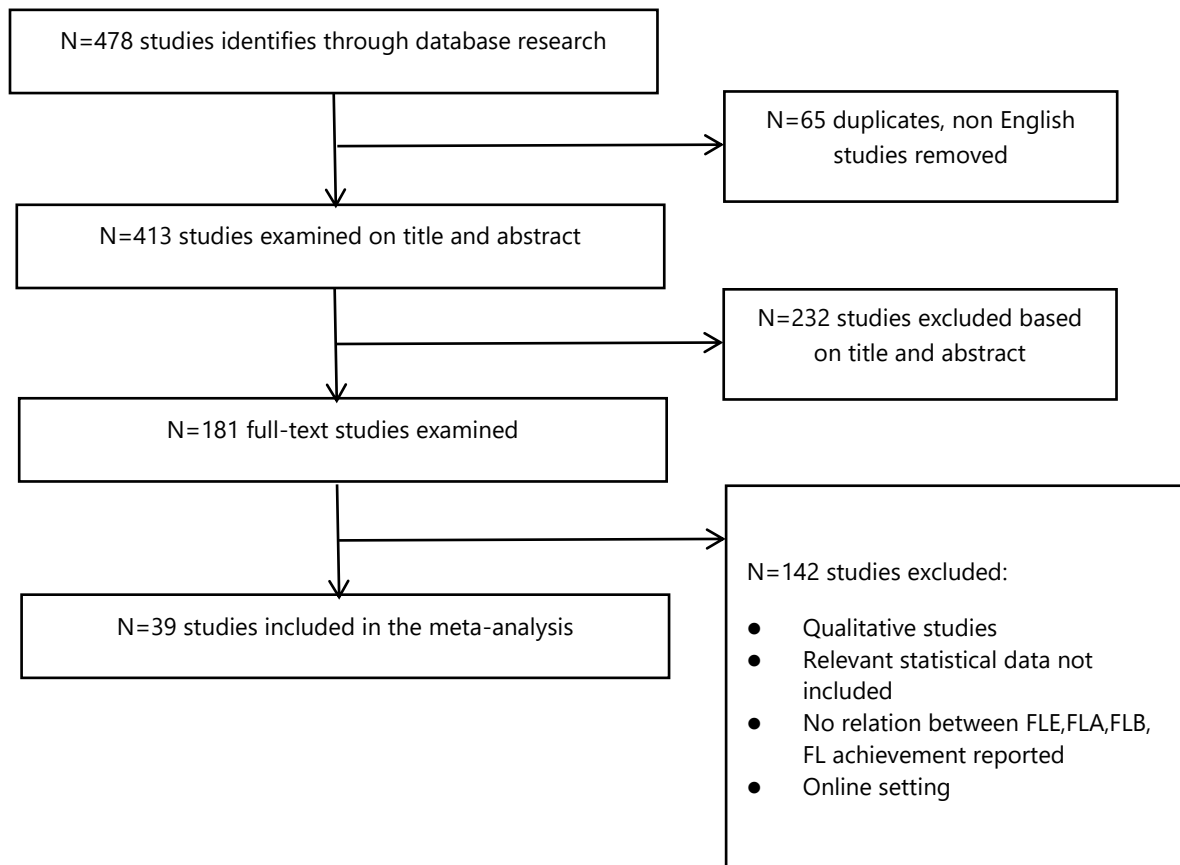


Figure 1 The Literature Inclusion and Exclusion Process

To calculate effect sizes, the independent sample was considered as a unit (Lei & Cui, 2016), with each sample encoded individually without repetition. The coding process followed a rigorous methodology:

(a) The correlation between foreign language emotions (FLA/FLE/FLB) and academic achievement was encoded. When a study reported academic emotions apart from FLA/FLE/FLB in the same sample, only the effect size of FLA/FLE/FLB was considered for the measurement of that academic emotion. If a study reported multiple dimensions of a particular emotion, only one effect size was noted for the measurement of that academic emotion, representing the most representative or significant relationship.

(b) The relationship between the two variables across different groups or conditions was also encoded. For instance, if a study reported different effect sizes based on regional location or domains of language achievement, these were recorded separately. This allowed for a more detailed analysis of the moderators and contextual factors that might influence the effect of emotions on language achievement.

3.4 Data Analysis

Comprehensive Meta Analysis 3.3 was employed to analyze all the data collected after the coding procedure. Before addressing the research question, the degree of heterogeneity in the meta-analysis was tested via the Q -value and I^2 statistics, with I^2 thresholds set at 25%, 50%, and 75% to classify heterogeneity as low, moderate, and high, respectively. Depending on the level of heterogeneity observed, the appropriate analytical model was chosen; a random-effects model was adopted in cases of high heterogeneity to account for variability across studies, while a fixed-effects model was employed in the absence of significant heterogeneity.

Next, the publication bias situation, where studies with significant results are more likely to be published than those with insignificant results (Begg & Berlin, 1988), leading to a problematic inclusion of comprehensive research, was evaluated by employing funnel plots, the fail-safe N , Begg and Mazumdar rank correlation; Egger Regression Analysis and trim and fill methods.

Then, the relationships between FLE/FLA/FLB and FL achievement were assessed by transforming the correlation coefficients (*r*) into Fisher's *z*-scores, following the established strategy proposed by Hedges and Olkin (1985), ensuring accurate and reliable estimation of the overall effect. To address the moderation, the effects of the two continuous moderator variables, average age and linguistic distance, on the effect sizes were analyzed by conducting a random-effects meta-regression with a restricted maximum likelihood estimator (Botes et al., 2022), while the categorical moderators of the observed effect, including language achievement measure, domain, and educational level, were investigated through subgroup analysis.

4. Result

4.1 Heterogeneity Test

A total of 39 studies, spanning the publication dates from 2015 to 2024, were thoroughly analyzed, including *K*=130 effect sizes. Furthermore, the data set comprised a comprehensive pool of *N*=91,405 participants. Table 1 shows the heterogeneity of the effect size among FLE, FLA, and FLB, which demonstrated that there was a significant degree of heterogeneity in the effect sizes of the three emotions. As shown in Table 1, the *Q*-values across the three variables reached significant levels (*p*<0.001), with *I*² statistic higher than 75%, signaling high heterogeneity. A random-effects model was chosen in this meta-analysis study based on the level of high heterogeneity.

Table 1 Result of heterogeneity test

emotions	k	Q	df	p	I ²	Tau-Squared
FLE	57	1102.13	56	0.000	94.92	0.027
FLA	47	1012.92	46	0.000	95.46	0.03
FLB	26	274.768	25	0.000	90.90	0.014

4.2 Publication Bias

Figures 2,3 and 4 demonstrated the publication bias among FLE, FLB, and FLA via funnel plots, reflecting the distribution of effect sizes for the relationship between the three FL emotions and FL achievement, respectively. The studies with large effect sizes were mainly concentrated at the top of the funnel plot and distributed on both sides symmetrically, indicating the absence of bias. The observed result shown in these funnel plots was subjective, thus inducing a necessity to quantify the publication bias. Therefore, the fail-safe *N*, Begg, and Mazumdar rank correlation, Egger Regression Analysis, and trim and fill methods were also introduced here. In the relationship between FLE and FL achievement, the Begg correlation was not significant (*p*=0.912); the intercept of the Egger regression test was -0.278 (*P*>0.05), and Classical Fail-safe *N* was 3510, which was far greater than 295 (5*k*+10,). This indicated that at least 3510 additional effect sizes would need to be included to reverse the results of the meta-analysis, suggesting that there was no publication bias in FLE. Similarly, in terms of FLB and FL achievement, there was no presence of publication bias, with *p*=0.842 in the Begg correlation, 0.269 intercept (*P*>0.05) of the Egger regression test, and 9853 in Classical Fail-safe *N*. However, regarding FLA and FL achievement, it was not significant in Begg correlation (*P*>0.05), and no publication bias was shown on Classical Fail-safe *N* (*N*=8072), but Egger Regression Analysis was significant (intercept=3.51, *p*=0.039<0.05). In this case, Duval and Tweedie's trim and fill were utilized to address publication bias. After 8 missing studies were filled on the right mean, the point estimate was -0.23, only 0.02 discrepancy compared with the original data (*r*=-0.259), indicating that there was only a small publication bias in FLA.

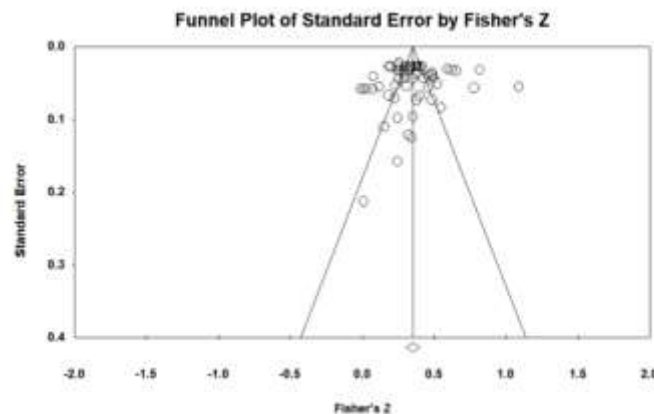


Figure 2 Funnel plot of FLE and FL achievement

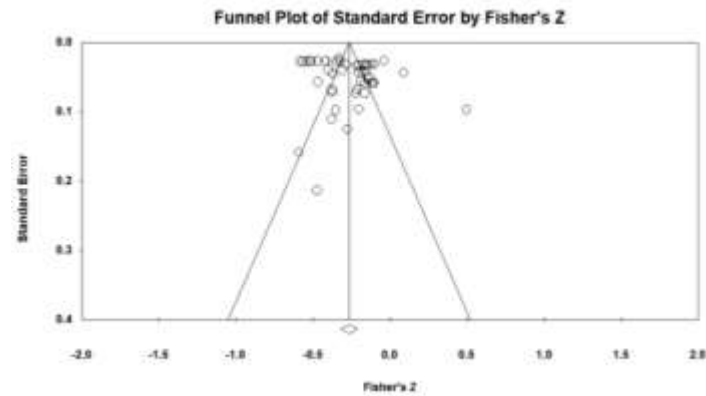


Figure 3 Funnel plot of FLA and FL achievement

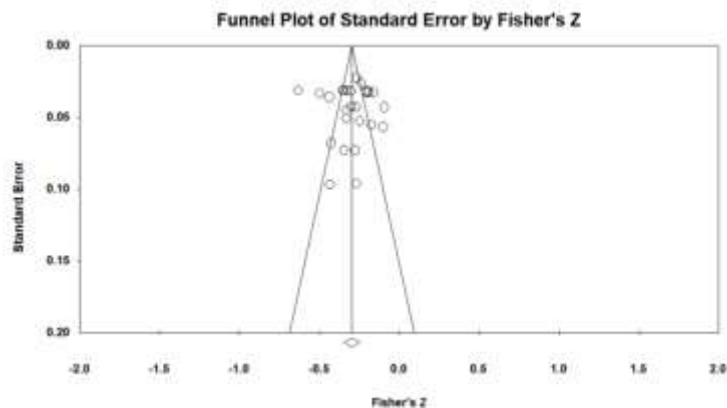


Figure 4 Funnel plot of FLB and FL achievement

4.3 Relationship between Academic Emotions and Language Achievement

The correlation between FL emotions and FL achievement was examined through random effects models. As shown in Table 2, the overall correlation between FLE and FL achievement was 0.339 ($P < 0.001$), with a 95%CI of [0.339;0.298], indicating that FLE positively predicts FL achievement. While the overall correlation between FLA and FL achievement was -0.259 ($P < 0.001$), with a 95%CI of [-0.259;-0.307], and the overall correlation between FLB and FL achievement was -0.288 ($P < 0.001$), with a 95%CI of [-0.288;-0.332], suggesting that both FLA and FLB had a negative relationship with FL achievement. Furthermore, the correlation between FLE and FL achievement was higher than that between FLA and language performance ($Q=306$, $P < 0.001$) and that between FLB and FL achievement ($Q=358.53$, $P < 0.001$), while there was no significant difference between FLA and FLB and FL achievement ($Q=0.711$, $p > 0.05$).

Table 2 Overall correlation between language-related academic emotions and language achievement measures

	k	r	95%CI	z	p
FLE	57	0.339	[0.339;0.298]	15.213	0.000
FLA	47	-0.259	[-0.259;-0.307]	-9.950	0.000
FLB	26	-0.288	[-0.332;-0.242]	-11.735	0.000

4.4 Moderation Analysis

High heterogeneity underscored the need for a closer look at the potential influence of moderators and additional variables, which could help explain the variability in observed correlations (Teimouri et al., 2019).

We began by exploring the relationship between FL emotions and achievement, analyzing how it varied based on age and linguistic distance. If $p < 0.05$, the moderators were significantly affected by the correlation between academic achievement and language performance. However, neither age nor linguistic distance was significant, with all their p value higher than 0.05 (See Table 3). Thus, the meta regression analysis showed that both age and linguistic distance didn't moderate the relationship between FL emotions and FL achievement.

Table 3 The moderator effects of age and linguistic distance on the relationship between language related academic achievement and language achievement

	k	β	SD	95% CI	z	p
FLE						
Age	54	-0.010	0.007	[-0.021;0.003]	-1.490	0.136
Linguistic distance	54	0.071	0.276	[-0.469;0.612]	0.260	0.796
FLA						
Age	43	0.002	0.007	[-0.012;0.015]	0.270	0.790
Linguistic distance	43	-0.154	0.341	[-0.823;0.514]	-0.450	0.650
FLB						
Age	24	-0.003	0.006	[-0.014;0.009]	-0.450	0.653
Linguistic distance	24	0.230	0.566	[-0.88;1.34]	0.410	0.684

Table 4 highlighted the mediating influence of education level, measures of achievement, and diverse linguistic domains. Notably, education level significantly moderated the relationship between FLA and language performance ($Q=53.257, p<0.001$), yet its influence was negligible in the case of FLE ($Q=6.4, p=0.094$) and FLB ($Q=0.365, p=0.947$). Additionally, the strength of the correlation peaked among senior students ($r=-0.41$) and waned among primary ($r=-0.165$) and junior school students ($r=-0.151$).

Different patterns emerged from the moderator analysis in relation to the role of various achievement measures. The results indicated that these measures acted as mediators between FLE ($Q=8.545, p<0.05$) and FLA ($Q=7.607, p<0.05$) and FL achievement. In contrast, the correlation between FLB and language performance remained constant regardless of the differing forms of achievement measures ($Q=4.852, p=0.088>0.05$). Particularly, self-perceived achievement demonstrated the strongest correlation ($r=0.445$ in FLE and $r=-0.328$ in FLB), while actual performance measured through course exams or standardized tests exhibited a less robust correlation.

The subgroup analysis results further indicated significant differences in correlations depending on language domains. Language achievement was not mediated by different language domains in its relationship with FLE. However, these domains functioned as moderators in the relationship between FLA and FLB and language achievement, particularly exhibiting a stronger impact of FLA on FL achievement ($p<0.001$). Additionally, students expressed significantly higher levels of anxiety during speaking activities compared to other language performances and reported the least anxiety during writing tasks. Nevertheless, students tended to experience greater boredom during reading activities compared to their general language performance or when engaged in writing. However, given the restricted number of studies available in the reading and writing subcategories ($k=2$ and $k=6$, respectively), the interpretation of the result should be undertaken with caution.

Table 4 The moderator effects of other subgroups on the relationship between language related academic achievement and language achievement

Emotion	Moderator	k	r	95%CI	Q	p
FLE	Education level				6.4	0.094
	Primary	4	0.425	[0.357;0.489]		
	Junior	11	0.327	[0.267;0.384]		
	Senior	20	0.379	[0.311;0.444]		
	University	19	0.301	[0.195;0.4]		
	Achievement measure				8.545	0.014
	Course exam	27	0.344	[0.280;0.406]		
	Self Perceived	9	0.445	[0.351;0.530]		
	Standardized	21	0.284	[0.228;0.339]		
	Domains				8.375	0.137
	General	32	0.375	[0.314;0.433]		
	Listening	2	0.188	[-0.033;0.392]		
	Reading	5	0.335	[0.193;0.463]		
	Speaking	4	0.304	[0.252;0.355]		
Writing	10	0.276	[0.185;0.363]			
FLA	Education level				53.257	0.000
	Primary	4	-0.165	[-0.228;-0.1]		
	Junior	11	-0.151	[-0.219;-0.083]		
	Senior	13	-0.410	[-0.457;-0.361]		

Emotion	Moderator	k	r	95%CI	Q	p
FLB	University	17	-0.215	[-0.287;-0.14]	7.607	0.022 •
	Achievement measure					
	Course exam	21	-0.196	[-0.259;-0.131]		
	Self Perceived	2	-0.328	[-0.423;-0.227]	33.15	0.000 • •
	Standardized	24	-0.303	[-0.361;-0.242]		
	Domains					
	General	22	-0.255	[-0.323;-0.184]		
	Listening	2	-0.262	[-0.515;0.033]		
	Reading	5	-0.296	[-0.409;-0.173]		
	Speaking	4	-0.470	[-0.530;-0.405]	0.365	0.947
	Writing	10	-0.197	[-0.274;-0.116]		
	Vocabulary	2	-0.403	[-0.575;-0.198]		
	Education level					
	Primary	4	-0.304	[-0.363;-0.243]	4.852	0.088
	Junior	9	-0.275	[-0.365;-0.180]		
Senior	4	-0.290	[-0.366;-0.211]			
University	7	-0.310	[-0.404;-0.209]			
Achievement measure						
Course exam	17	-0.252	[-0.293;-0.211]	6.971	0.031 •	
Self Perceived	2	-0.435	[-0.660;-0.137]			
Standardized	7	-0.327	[-0.390;-0.261]			
Domains						
General	17	-0.252	[-0.298;-0.205]			
Reading	2	-0.368	[-0.449;-0.281]			
Writing	6	-0.351	[-0.450;-0.243]			

• p<0.05; • • p<0.01

5. Discussion

The results of our meta-analysis indicate that FLE exerts a positive influence on FL achievement, whereas FLA and FLB have negative impacts. Remarkably, FLE emerges as the most significant factor affecting FL achievement. The analysis further reveals that age and linguistic differences do not exert any influence on the relationship between language-related academic achievement and FL achievement. Education level is identified as a mediator between FLA and language performance, with senior students experiencing the most significant negative effects of FLA. The type of achievement measure also plays a crucial role in mediating the effects of FLE and FLA on language achievement. However, FLB stands as an exception in this context. Interestingly, FLE and FLA demonstrate a strong correlation with self-perceived achievement rather than with actual language performance measured through course exams and standardized tests. Moreover, the correlation between academic emotions and language performance is influenced by different language domains, with FLE being an exception. Specifically, speaking activities are found to have the most profound impact on FLE, while reading performance is significantly influenced by FLB (Wang et al., 2023).

5.1 The Relationship Between Academic Emotions and FL Achievement

FLE is a positive predictor of FL achievement. The result is in line with Botes et al. (2022) finding that the presence of enjoyment in the FL classroom was found to be associated with decreased anxiety, stronger willingness to communicate in the target language, better academic achievement, and a more favorable self-perception of their language learning progress. The positive effect of FLE on language performance conforms to the broaden-build theory of positive emotions (BBT) proposed by Fredrickson (2001). BBT posits that positive emotional experiences broaden individuals' momentary range of cognitive and behavioral responses, mitigating the persistent effects of negative emotions. This, in effect, fosters the development of their long-term personal resources, including various aspects, from the physical and intellectual to the social and psychological. Thus, FLE enhances students' cognitive abilities, promotes the optimal use of cognitive resources (Yeung et al., 2023), and focuses their attention on the language learning process, ultimately leading to improved language achievement. Moreover, FLE exhibits a favorable correlation with several key elements that are integral to achieving successful language outcomes. These elements include a robust perception of one's ideal self in the second language (L2), a high degree of motivation, active engagement in language learning activities, strong self-efficacy, and exceptional self-regulatory abilities. By highlighting the positive relationship between FLE and these critical components, we underscore their combined importance in fostering effective language acquisition and achievement.

Considering the weight of the three emotions, the findings strongly suggest that FLE is a more potent predictor of FL achievement than FLA and FLB. The result is also confirmed by the study of Li and Wei (2023), which declared that FLE emerges as the one with the longest-lasting independent predictive impact on subsequent FL achievements. This is not merely a transient phenomenon but a deep-seated psychological mechanism that equips learners to persevere in their efforts, maintain resilience, and sustain motivation throughout the often challenging and protracted process of acquiring a new language (Badieli et al., 2023; Choi & Lee, 2023). The role of FLE in fostering a positive learning attitude and enhancing learners' ability to cope with the demands of language learning cannot be overstated. Its influence extends beyond the classroom, shaping learners' approach to language acquisition and their overall success in achieving their FL goals. Therefore, consistent with positive psychology, educators are increasingly encouraged to prioritize promoting enjoyment and other positive emotions in language classrooms or beyond the classroom rather than solely focusing on addressing negative emotions.

On the other hand, boredom, being a negative, deactivating emotion associated with academic performance, exhibits a less pronounced effect, which can be elucidated by the Control-Value Theory (Pekrun, 2006). This theory posits that control and values are centered on actions, not outcomes. Consequently, a learner experiencing boredom tends to direct their attention towards the act of learning rather than their test scores.

Similarly, our meta analysis supports the negative effects of FLA on FL achievement. The findings of Teimouri et al. (2019) align closely with the present study, further validating the profound negative impact of FLA on students' achievements in the context of foreign language (FL) learning when compared to other subjects, based on their comparison of statistical data with other related meta-analyses conducted on non-English subjects. The negative correlation between FLB and FLA with FL achievement can be attributed to Cognitive Load theory (CLT). CLT, proposed by Sweller (1988), refers to a scientific theory that focuses on understanding the cognitive demands placed on individuals during learning tasks. CLT maintains that managing this load to stay within the constraints of working memory is essential. The aspect of cognitive load that is unnecessary for learning is termed extraneous or unproductive load (Kalyuga, 2011). Negative emotions like FLA and FLB may act as a source of extraneous cognitive load, diverting attention from the task and competing for limited working memory resources by demanding the processing of information unrelated to the task. Furthermore, negative emotions can have a direct impact on memory by narrowing cognitive resources, resulting in impaired encoding, storage, and retrieval of information, even at the unconscious level (Plass & Kalyuga, 2019). In this regard, the adverse effects of FLA and FLB are consistent with BBT, indicating that anxiety and boredom, as negative emotions, might restrict an individual's ability to focus and think deeply, weaken the development of personal and social resources, and thereby hinder the growth of language learning within that individual (Fredrickson, 2004). Moreover, FLA and FLB are correlated with reduced learning motivation and disengagement (Li, Dewaele, et al., 2023), ultimately leading to a decline in learning achievement.

5.2 Moderators

5.2.1 Age

Age doesn't serve as a moderator in this meta analysis. However, we can discern a tentative trend associating emotions and FL achievement across different age groups. As learners age, FLE and FLB gradually decrease, whereas anxiety among students tends to increase as they grow older. The negative relationship of FLE is supported by Tsang and Dewaele (2023) and Li(2022), indicating that there seems to be a latent power in the enjoyment that can effectively banish boredom and anxiety, leading to their proficiency improvement and young FL learners benefit more from the help of FLE. In terms of FLA, Teimouri et al. (2019) also suggest that as learners age, they tend to experience higher levels of anxiety. However, the relationship between FLA and FL achievement is not linear across different age groups. It is postulated that anxiety levels fluctuate, with students feeling less anxious as they accumulate more L2 experience over time. Conversely, they may experience increased anxiety due to novel experiences and the additional responsibilities imposed by the ever-changing educational landscape. As for FLB, it serves as a slightly negative moderator of emotions and language achievement, yet Li (2022) discovered that language learners' boredom intensifies with age. The inconsistency in these findings could be attributed to variations in participants' FL learning environments and linguistic proficiency. Nevertheless, further research is necessary to elucidate the impact of age on emotions and linguistic performance.

5.2.2 Linguistic distance

Our meta analysis suggests the relationship between language-related academic emotions and FL achievement remains unchanged irrespective of the linguistic distance. This finding aligns with the meta-analysis conducted by Teimouri et al. (2019), which did not reveal significant differences in the anxiety-achievement connection between second language and FL contexts in our study. However, Botes et al. (2021) observed that FL learners whose native language exhibits greater linguistic similarity to the target language report experiencing less anxiety and greater enjoyment. Notably, there is a dearth of research exploring whether linguistic distance serves as a moderator for FLB and language achievement. Additionally, further investigation is needed to understand how linguistic distance influences the intersection of language-related academic emotions and FL achievement.

5.2.3 Education level

Education level functions solely as a moderator for FLA and language achievement, yet it lacks significance in terms of FLE and FLB. Particularly, it was discovered that the negative impact of anxiety on students' language proficiency is most profound in senior secondary school. The present result contradicts the discovery made by Teimouri et al. (2019), which indicated that the earlier stages of education, particularly primary school, demonstrate the most profound negative impact of anxiety on students' language proficiency. This discrepancy may be attributed to the fact that younger students possess fewer abilities to manage anxiety and the surrounding factors that trigger these adverse emotions. The inconsistency in the results may stem from the diverse contexts explored in various studies. The data collected in our meta-analysis was primarily sourced from the context of China, where the primary objective for senior students is to successfully pass the Gaokao or the National College Entrance Examination. This high-stakes exam holds a pivotal role in shaping students' educational and career prospects, thereby generating immense pressure. The intense competition for limited university spots, coupled with cultural expectations for academic excellence, contributes to the high levels of anxiety experienced by senior students. Furthermore, the Chinese English education system tends to prioritize rote memorization and test performance, which can further exacerbate anxiety levels.

5.2.4 Achievement measures

Another crucial moderation between FL emotions and language performance is the various achievement measures employed to quantify students' language performance. Course exams, standardized tests and self-perceive achievement are three primary methods of measurement, among which self-perceived achievement exhibits the strongest correlation with FLE and FLA. Although achievement measures do not serve as moderators for FLB and FL achievement, self-perceived achievement still ranks higher among the three measures. This result is in line with MacIntyre et al. (1997) that students experiencing anxiety tend to underestimate their language proficiency when it comes to specific tasks despite objective measures indicating higher performance scores. This tendency can be attributed to several reasons. They might lack confidence in their abilities, stemming from past negative experiences or a fear of making mistakes. Additionally, they might not fully grasp the evaluation criteria, causing doubts about their scores or the evaluation process. Comparisons with peers and anxiety related to language learning can also contribute to underestimating their own proficiency. These factors can collectively influence students' self-perception, leading them to believe that their language proficiency is lower than it actually is. However, despite the potential risk of subjectivity inherent in relying on self-perceived achievement, researchers can confidently include this measure as it moderately and positively correlates with actual English test results. Furthermore, self-perceived achievement serves as a more robust predictor of learners' actual performance compared to a single test result, as it is based on numerous previous test outcomes and performances (Li, 2020).

5.2.5 Language domains

In this meta-analysis, we have confirmed that language domains serve as moderators, significantly influencing the relationship between emotions and language achievement. Specifically, our findings indicate that students report experiencing the highest level of anxiety during speaking activities, whereas writing activities elicit the lowest levels of anxiety. These findings contrast with those reported by Bielak (2022), who observed that FLA may have a particularly strong impact on language learning at the linguistic input and processing stages compared to output production, such as speaking. However, our findings align more closely with the research conducted by Zheng and Cheng (2018), who noted that university students experienced anxiety towards oral English, especially speaking skills in the classroom, despite generally feeling less anxious in English classrooms and during testing. In terms of writing anxiety, this finding is consistent with Li et al. (2023), who observed that the nature of writing is less anxiety-provoking compared to other language activities.

The discrepancy in anxiety levels between speaking and writing can be attributed to several factors. Speaking activities, such as live and interactive events, expose students to the immediate pressure of a live audience. This real-time interaction can heighten feelings of anxiety, especially among students who fear making mistakes or being judged by their peers or teachers. On the other hand, writing, as a recursive activity, affords students the opportunity to compose their thoughts without the immediate pressure of a live audience. The written format also allows for revision and refinement, which can alleviate concerns about potential mistakes or misunderstandings.

Furthermore, when writing is assigned as homework rather than a test, students can work at their own pace and comfort level. This flexibility eliminates the need to keep up with the demands of a classroom or group setting, further reducing anxiety. In contrast, speaking activities often occur in a more formal and structured setting, such as a classroom or testing environment, which can contribute to feelings of anxiety.

The inconsistency in the findings reported by different researchers may also be attributed to differences in the study participants' language performance, education levels, and cultural backgrounds. For instance, Bielak (2022) investigated advanced English learners in Poland who were proficient in oral tests, thus experiencing less anxiety during speaking activities. However, most of our participants were at a lower or intermediate level and learning English as a foreign language in a Chinese context, where the

education system is predominantly focused on high-pressure exams. As a result, our participants may have faced unique challenges and anxieties related to their language learning experience.

As for FLB, the current meta-analysis indicates that reading activity appears to be more strongly associated with feelings of boredom in FL learning compared to writing. The explanation of this finding may lie in the nature of the reading and writing process. Reading often involves a passive process of decoding text, which can become monotonous for learners, especially when the content is not engaging or relevant. Additionally, comprehension challenges, such as dealing with complex texts or unfamiliar vocabulary, can lead to feelings of frustration and boredom. Cultural and linguistic differences can also contribute to this, as learners may feel disconnected from the text when encountering unfamiliar cultural references or language structures. On the contrary, writing activity involves a more active process of expressing thoughts and ideas, which can be more stimulating. It allows learners to engage with the language in a more personal and creative way, leading to a deeper understanding. Writing also often involves research and gathering information, adding variety and excitement to the learning process.

However, it's worth noting that our understanding of students' emotional responses to speaking and listening activities is limited, as there is a paucity of literature collected in this meta-analysis specifically focusing on boredom in these domains. Therefore, while we might assume that reading boredom may be more prominent than boredom experienced during listening and speaking, such a conclusion remains tentative due to the limited available data. Moreover, the scarcity of studies investigating domain-specific boredom in language learning calls for caution in interpreting our findings. Despite the fact that research on boredom in language instruction generally suggests that boredom is a prevalent emotion among students in school settings, affecting the quality of learning, the available sources do not explicitly indicate that reading boredom is more unusual or prominent compared to boredom experienced in other language domains. Future research is needed to delve deeper into the domain-specific nuances of boredom in language learning,

6. Conclusion

This meta-analysis has investigated the relationship between language-related academic emotions and language achievement, synthesizing the findings from 39 studies across 9 countries. Our finding has shown that FLE has a positive impact on language achievement, while FLA and FLB have negative effects, with FLE being the strongest predictor. Additionally, we have found that educational level, achievement measures, and language domains serve as important mediators in this relationship.

However, we should be cautious not to overgeneralize these explanations excessively or hastily to classify them into "laws" of effective learning and teaching practices (Dewaele & MacIntyre, 2014). Indeed, the study also highlights several limitations. Firstly, most of the research has been conducted in a cross-sectional way, precluding the exploration of causal relationships among different factors (Dewaele & Li, 2022; King & Gaerlan, 2014; Zhao & Yang, 2023). Future research could employ longitudinal studies to uncover the underlying truth of how these emotional experiences evolve throughout the language-learning process.

Secondly, despite the established bidirectional relationship between learner emotions and language proficiency or learning, as emphasized by Botes et al. (2020), there remains a significant research gap in exploring the reverse effects of language achievement on learner emotions. Future research is needed to delve into how language achievement can positively or negatively impact learner emotions, leaving a crucial void in our understanding of this complex and dynamic relationship.

Thirdly, the moderating role of crucial learner characteristics, such as gender, remains under-examined, as results for males and females are reported jointly. The high heterogeneity across studies also indicates the presence of unexamined moderators that could explain the inconsistent correlation between academic emotions and language performance. Future research should separately analyze these characteristics and explore additional moderators to gain a more comprehensive understanding of language performance.

Fourthly, the limitations of the current study regarding the measurement of emotions are noteworthy. Both general and domain-specific measures of emotion have been employed, often interchangeably, in assessing both general language achievement and specific language performance, potentially contributing to the inconsistency in results observed in the correlation between FL emotions and language performance. Future studies must prioritize the development and validation of more nuanced and systematic measures of emotional responses in language learning contexts. This approach would offer a deeper understanding of the role of emotions in language learning and potentially reveal more effective strategies to enhance language acquisition and performance.

Fifthly, there is a significant research gap regarding the investigation of emotional experiences in diverse learning environments and cultural-linguistic contexts. While some studies have examined emotions in traditional classroom settings, there is a paucity of research exploring how emotions manifest and interact in alternative learning environments, such as online courses, immersive

language programs, or study abroad experiences (Dewaele & Li, 2022; Teimouri et al., 2019; Zhao & Wang, 2023). Similarly, the majority of existing research has been limited to English language learners in Chinese contexts, neglecting the cultural and linguistic variability in foreign language emotions across different languages and cultural backgrounds.

Indeed, numerous aspects remain awaiting exploration to gain a more holistic understanding of the role of foreign language emotions in the learning process. Nevertheless, the meta-analysis has confirmed the powerful and enduring influence of FLE, aligning with the principles of positive psychology. Therefore, teachers are encouraged to prioritize fostering student enjoyment by cultivating a harmonious learning environment. By doing so, not only can we enhance the overall quality of language education but also contribute to the development of more engaged and motivated learners.

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