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The Effect of Language Learning Anxiety on Academic Performance—Cognitive Learning Strategies as Moderating Variables

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ABSTRACT

While the negative effects of language learning anxiety (LLA) on both language learning exercises and the cognitive learning strategies (CLS) associated with language learning have been thoroughly investigated, the effects of LLA on CLS and whether CLS, as a moderating variable, regulates the correlation between LLA and academic performance are yet to be scrutinized. In view of this situation, this study delves into the correlation between LLA and CLS, as well as the moderating effect of CLS on the relationship between LLA and ACH. Quantitative research methods and a questionnaire were employed for an investigation involving 736 university-level participants majoring in foreign languages. The participants were randomly selected from University A of China. According to the findings, language confidence (LC) and academic anxiety (AA) registered a significant negative reading towards CLS, while communication apprehension (CA) and classroom anxiety (CN) registered a non-significant negative reading towards CLS. The findings also indicate that CLS has a significant moderating effect on the correlation between LLA and academic achievement (ACH). Generally, the findings derived through this study serve to identify the negative effects of LLA on CLS. These findings provide university lecturers, as well as instructional policymakers, with a reference for future curriculum preparation.

Keywords: Foreign Language Learning Anxiety; Cognitive Learning Strategy; Academic Achievement; Moderating Effect

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1. Introduction

Language learning anxiety (LLA) is among the most significant emotional factors influencing the foreign language learning process [1–3]. The raised stress levels, brought about by an examination-oriented education system and its associated heavy learning burden, have contributed towards an escalation in the learning anxiety of students [4–6].

For the most part, researchers in this domain [2, 7–14] are in agreement that foreign language learning is negatively affected by LLA. To put it bluntly, the more pronounced the students' foreign LLA, the lower their language learning capacity. In order to overcome this impediment to the students' language acquisition process, researchers have resorted to intervention experiments and mitigation strategies. Intervention experiments frequently involve investigations on the regulation of the learners' emotions, and the teaching strategies of their teachers [15, 16]. Xu and He [16] opined that in order to alleviate anxiety, students turn to approaches which include attention allocation, cognitive reappraisal, and capability development.

Cognitive learning strategy (CLS) refers to a learner's knowledge about his/her learning system, learning resources, and learning processes, as well as his/her universal beliefs regarding the issue of learning. This also covers knowledge regarding a learning task, as well as the distinctive goals and requirements associated with the said task [12, 13]. According to the findings from recent studies, the learning strategies employed by students to cope with the psychological stresses deriving from the language learning process include information encoding, organization and recall manoeuvres. It has been observed that these strategies can promote students' capacity for managing anxiety, and consequently enhance the effectiveness of their learning process [17, 18].

CLS comprises declarative, procedural, and conditional knowledge regarding learning strategies (learning strategy knowledge). This refers to the learner's knowledge about a particular learning strategy, the manner in which it is to be applied, as well as 'when and why' a particular learning strategy is appropriate [19]. This undertaking investigates the capacity of CLS, in terms of moderating the influence of LLA over academic achievement (ACH).

2. Literature Review

2.1. Theoretical Framework

Oxford [20] explored the correlation between anxiety and language learning strategies, to report a significant correlation between anxiety levels and the use of learning strategies, particularly the use of CLS. According to her findings, learners with higher anxiety levels tend to use fewer CLS. This phenomenon may be due to the fact that high anxiety levels distract learners, from effectively using strategies to deal with language learning tasks. Additionally, studies in this area have revealed that other than affecting the frequency of CLS use, anxiety also influences the diversity of strategies employed. For example, learners with high levels of anxiety may resort mostly to simple, inefficient strategies, and less complex strategies that contribute towards deep learning [21]. This disparity in strategy use, further affects the effectiveness of language learning, leading to learners facing more challenges, during efforts to improve their language proficiency. In view of this predicament, Oxford's study focuses on the significance of learners' anxiety levels during the language teaching process, and recommends strategy training, to facilitate improved anxiety management among students, to consequently boost their language learning capacity [22]. Additionally, the Affective Filter Hypothesis [23] proposed that emotive factors contribute to the filtering of language input. Language learning process can be slowed down or accelerated by affective factors. Anxiety is one of main factor which negative influences in language acquisition or language learning achievement. Hence, we came to the conclusion that CLS has a favourable influence on ACH and can successfully lower LLA, while LLA has a negative affect on ACH.

2.2. Effect of Language Learning Anxiety (LLA) on Academic Achievement (ACH)

Anxiety, a subjective emotion that causes uneasiness, nervousness, apprehension, worry, and self-doubt, is a self-depreciating cognition which can be classified under trait anxiety, state anxiety and situation-specific anxiety [5, 6].

The professed foreign LLA refers to distinct psychological activities, including self-perception, perception of

foreign language learning, emotions associated with foreign language learning, and learning behaviours brought about by the unique language learning process in the foreign language classroom[7]. The foreign language learning anxieties include classroom anxiety (CN), communication apprehension (CA), academic anxiety (AA), and language confidence (LC). These anxieties can negatively affect a student's learning process, and lead to problems which include decreased concentration, weakened memory, and hindered communication skills. Horwitz et al.[8, 9] defined foreign language CN as "a distinct complex of self-perceptions, beliefs, feelings, and behaviours related to classroom language learning arising from the uniqueness of the language learning process."[9] Foreign language classroom anxiety encompasses "a suite of anxieties". Communication apprehension (CA) refers to a sense of fear and frustration, caused by a lack of professional vocabulary and knowledge, as well as the difficulty to accurately interpret the views of others during interactions. CA is expressed as the apprehension encountered during interpersonal communication, in anticipation of a negative evaluation, leading to the avoidance of evaluative situations. Put plainly, learners worry over their inability to express their thoughts in the target language, leading to anxiety and tension during interaction episodes[10]. MacCroskey[11] stated that the typical behaviour associated with CA entails the avoidance of communication, or the distancing from interaction situations. While learners may have the intention to communicate with others, this intention can be tempered by CA. Learners affected by CA, are constantly worried and apprehensive about their inability to interpret and comprehend the expressions of others, during the process of communication.

Culler and Holahan[12] are of the opinion that AA may stem from defects in the learning skills of students. AA is represented as a set of phenomenological, physiological, and behavioural responses, which come hand in hand with concerns regarding potential negative consequences, stemming from an examination, or a similar evaluative situation[13]. The quizzes, typically conducted in foreign language classes, often cause students to feel pressured and anxious, which can lead to a dip in their performance, and an impediment to their progress. Aida[24] states that AA stems from the student's recollection of his/her many past learning failures, which contributes towards an escalation in his/her apprehension level. As such, before and during an examination the student's performance is negatively affected by the recollection of these past learning failures.

Language confidence (LC) refers to a person's self-assurance and comfort levels with regards to the usage of a particular language[25]. A higher level of LC translates into greater foreign language learning satisfaction, which consequently partly mediates the correlation between LC and language learning[26]. As such, students lacking confidence, in their language learning capability, may be perceived as less competent or less capable by their colleagues or teachers, a circumstance which can potentially culminate in poor language test results.

A substantial number of investigations conducted on LLA, focused on the issues of listening anxiety[27, 28], reading anxiety[29], and speaking anxiety[30]. The findings, derived from several empirical studies, reveal a prominent negative correlation between the level of learners' foreign language classroom anxiety, and foreign language learning achievement. Teimouri et al.[31], for instance, examined data from 97 studies regarding the correlation between LLA and ACH, in terms of facilitative anxiety, to report that LLA is negatively associated with language learning achievement. Zhou et al.[32] delved into the correlation between LLA and motivation during Level 2 learning, and its moderators. Their investigation, comprising 51 studies involving 14,178 participants, revealed a negative correlation between LLA and ACH.

The investigation conducted by Zhang[33] revealed a negative and significant relationship, between foreign language anxiety and foreign language performance. In a study focusing on foreign LLA, involving 631 Chinese students of English as a first language (EFL) Li Qing[1] reported that the correlation between foreign language anxiety and language learning level is significantly negative. Put simply, the higher the language level, the lower the level of foreign language anxiety, and vice versa. This is an indication that LLA is negatively correlated with ACH.

2.3. Effect of Cognitive Learning Strategies (CLS) on Academic Achievement (ACH)

Cognitive learning strategies (CLS) play a significant role during the initial stage of the foreign language learning process. CLS portray the manner in which an individual

learns a language and describes visible behaviour through acquired expertise[34, 35]. Considering a high-level implementation skill, the cognitive learning strategies are essential for effective planning, monitoring, and evaluation exercises. In terms of its role in boosting the learning effect[36], the CLS is crucial for effective language learning activities, with language learners consciously applying relevant skills and methods, based on their own cognitive knowledge. This summarizes the functions of cognitive learning strategies[17].

Generally, cognitive learning strategies are methods, behaviours, and measures exploited by students, to enhance the effectiveness of their learning process[37]. While Oxford[17] verified that cognitive learning strategies deliver a positive impact on the learning process, it is notable that learners may or not be aware that they are utilizing them. Generally, researchers[35–38] in this domain are in agreement, that CLS contributes greatly towards the enhancement of the language learning process.

The degree of cognitive knowledge differs greatly between good learners and poor learners, with the greater degree of cognitive knowledge associated with good learners, leading to better learning outcomes. It has also been observed that the level of cognitive knowledge influences the learners' learning outcomes. Cognitive awareness and skills serve to enhance the students' listening capacity, while promoting their motivation and self-confidence[10, 39, 40].

The application of cognitive learning knowledge for foreign language learning facilitates the development of the students' autonomous learning capability, while enhancing their foreign language proficiency[16, 28, 41].

2.4. Correlation between Language Learning Anxiety (LLA) and Cognitive Learning Strategies (CLS)

Oxford[20] detected a significant correlation between anxiety and the use of CLS. According to her, learners with higher levels of anxiety tend to use fewer cognitive learning strategies. For the most part, researchers emphasize the inverse correlation between LLA and CLS. Elevated LLA correlates with reduced CLS use. An investigation conducted by MacIntyre and Gardner[10], demonstrates the manner in which anxiety can impede the various language processing stages, including the input and output processing stages. They forwarded that language anxiety can lead to the creation of a cognitive burden, to divert attention away from language tasks, while impairing the memory and retrieval processes. During their study, they carried out a series of experiments, to scrutinize the correlation between anxiety and cognitive processing, applying measures which include reaction times and error rates, in relation to language tasks. This research highlights the various ways, in which the impact of anxiety, on second language acquisition and performance, can extend beyond simply affecting the self-confidence or motivation of the learner. A deeper understanding of the cognitive mechanisms triggering language anxiety is provided, while the importance of addressing anxiety in the context of language learning is highlighted, to realize more effective learning approaches. Teimouri et al.[31] scrutinized data from 97 studies on the correlation between anxiety and ACH to report that anxiety negatively influences strategy use. Similarly, Ahmed Abdel-Al Ibrahim et al.[42] observed that anxious learners evade complex strategies, including self-evaluation, in favour of inconsequential memorisation. The findings from intervention experiments also reveal that currently accessible strategies have a positive impact on students' English CN. This is an indication of the applicability of the cognitive learning strategy, as an intervention approach in language learning[41, 42].

2.5. Research Questions

1. Does LLA significantly affect CLS?
2. Do CLS significantly moderate the correlation between LLA and ACH?

2.6. Research Hypotheses

Based on the literature review, as shown in **Figure 1**, the present study hypothesised:

Hypothesis 1. *CN has a significantly negative effect on CLS.*

Hypothesis 2. *CA has a significantly negative effect on CLS.*

Hypothesis 3. *AA has a significantly negative effect on CLS.*

Hypothesis 4. *LC has a significantly negative effect on CLS.*

Relevant literature also documents a negative correlation between LLA and ACH, a positive correlation between CLS and ACH, as well as the potential of CLS as an intervention strategy for LLA in the language learning process.

As such, the present study also proposed the following hypothesis:

Hypothesis 5. *CLS significantly moderates the correlation between LLA and ACH.*

The five research hypotheses of the present study are as shown in **Figure 2**.

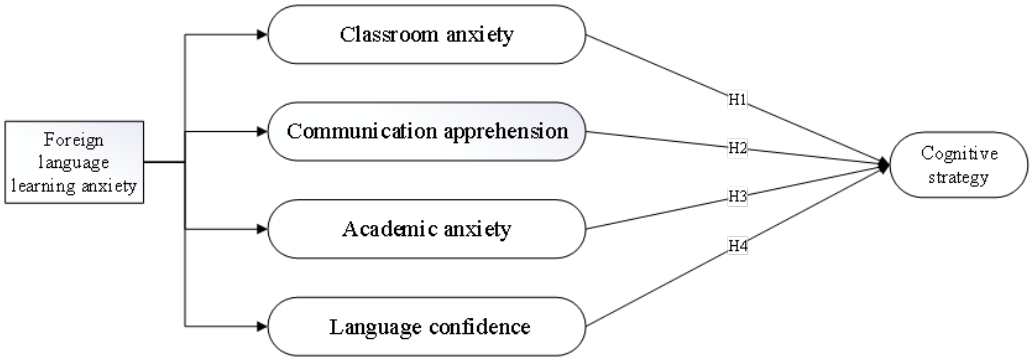

Figure 1. The first four research hypotheses of the present study.

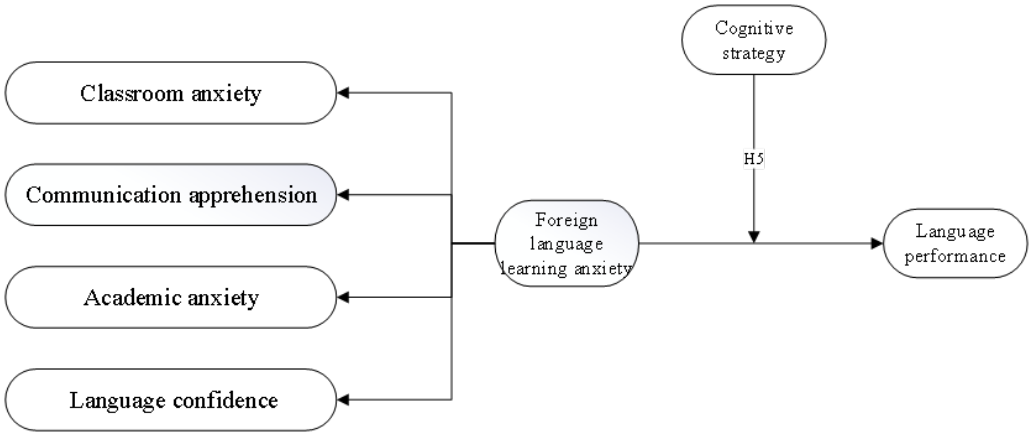

Figure 2. The five research hypotheses of the present study.

3. Research Methodology

The quantitative survey approach was applied for an investigation on the correlation between LLA and CLS of Chinese university-level foreign language students. The instruments of LLA and CLS, for this study, are based on Horwitz's Foreign Language Anxiety [9] and Oxford's Strategy Inventory for Language Learning [17]. The instrument was separated into three sections, with Section 1 focusing on the gathering of the participants' demographic information and final exam result for foreign language major as ACH. Section 2 accommodating the LLA and CLS items, and Section 3 incorporating the CLS items. The instrument was randomly distributed to the target students from one of university in China, following the assurance that their responses to the survey will remain confidential, and utilized solely for the study. The questionnaires were distributed to them through the university's academic affairs office. Out of the 740 questionnaires distributed, we received 736 valid responses.

The Cronbach alpha of LLA items ranged from 0.715–0.935, and 0.933 of CLS items, thus meeting the satisfactory range of 0.65–0.95 [32]. As such the questionnaire is deemed acceptable for use in this study.

4. Results

4.1. Does Language Learning Anxiety (LLA) Significantly Affect Cognitive Learning Strategies (CLS)?

The paths of the influence of LLA on CLS are shown in **Figure 3**, as depicted in **Table 1**, the path coefficient of

LC on CLS is –0.451 with $p < 0.05$, indicating a significant negative impact of LC on CLS. The path coefficient of AA on CLS is –0.225, again with $p < 0.05$, indicating a significant negative effect of AA on CLS. The path coefficient of CA on CLS, however, is –0.103, with $p > 0.05$, indicating a non-significant negative impact of CA on CLS. The path coefficient of CN on CLS is 0.00, with $p > 0.05$, indicating a non-significant correlation between CN and CLS. As such, H1 and H2 were rejected, while H3 and H4 were supported.

4.2. Do Cognitive Learning Strategies (CLS) Significantly Moderate the Correlation between Language Learning Anxiety (LLA) and Academic Achievement (ACH)?

PROCESS macro® version 3 regression analysis was employed for the investigation on H5. As portrayed in **Table 2**, CLS significantly moderates the correlation between LLA and ACH as shown in **Figure 4** ($\beta = 0.136$, SE = 0.057, $p < 0.05$). As such, H5 is supported.

Table 1. The regression weights.

Paths	Estimate	S.E.	C.R.	p
CLS<—LC	–0.451	0.082	–5.820	0.00
CLS<—AA	–0.225	0.040	–2.565	0.010
CLS<—CA	–0.103	0.037	–1.200	0.230
CLS<—CN	0.000	0.036	–0.006	0.995

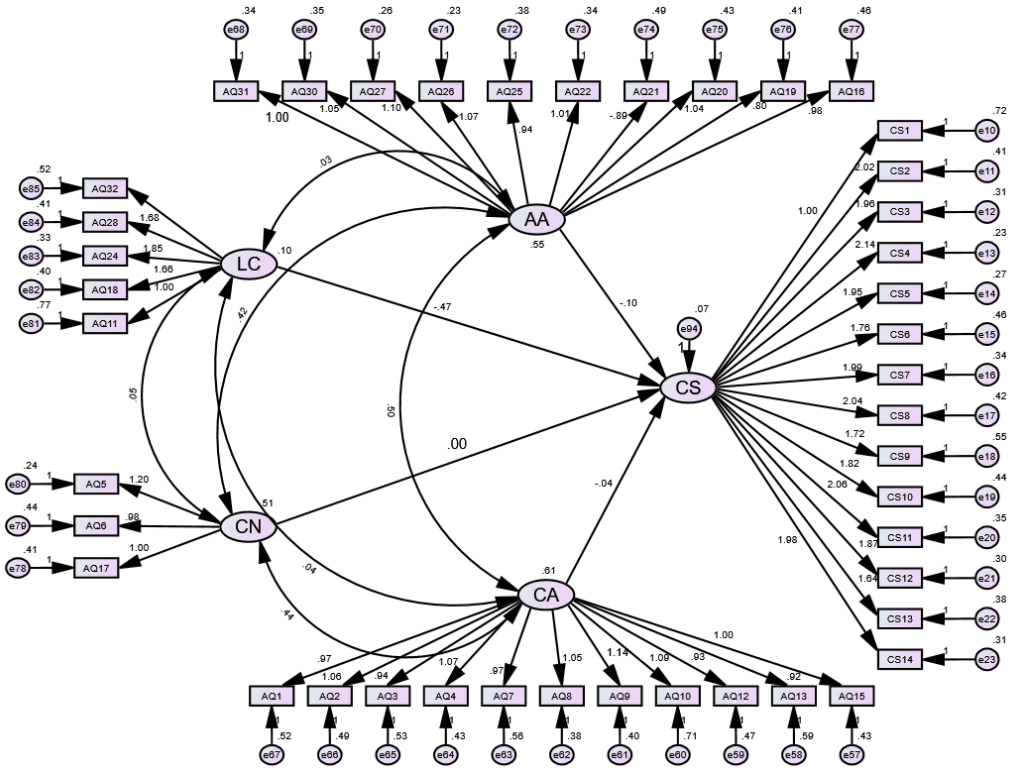

Figure 3. The influence of LLA on CLS.

Table 2. CLS as a moderator of the correlation between LLA and ACH.

Model	Coeff	S.E.	t	*p*	LLCI	ULCI
CLS moderates LLA and ACH	0.136	0.057	2.400	0.017	0.025	0.248

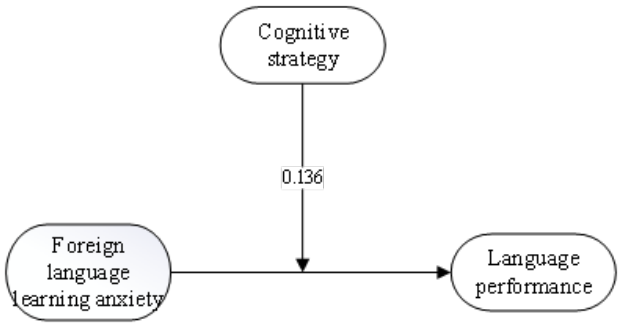

Figure 4. The moderating effect of CLS on LLA and ACH.

5. Discussion

5.1. Correlation between Language Learning Anxiety (LLA) and Cognitive Learning Strategies (CLS)

The findings, derived through this study, indicate a significant negative impact of LC on CLS. Put simply, the lesser the learners' anxiety with regards to LC, the greater their CLS. This result is consistent with the result derived through the study conducted by Hammer et al.[43], which also revealed that LC has a negative effect on CLS. In the context of AA and CLS, the analysis result also verified a significant negative impact of AA on CLS. Salem and Dyiar[44] forwarded that anxiety negatively affects learners' capacity to deliver fluent speech, as it exposes their confidence, focus and performance to judgement. The significant negative correlation between AA and CLS, revealed through their investigation, is in agreement with the findings derived through this current study. The negative effects of AA on CLS are also demonstrated in the studies conducted by Keogh and French[45], as well as Guo and Libo[46].

However the finding derived through this current study, indicates a non-significant effect of CA on CLS, which can be put down to the observation, that learners' anxiety, with regards to CA, does not affect their employment of cognitive learning strategies. This finding is inconsistent with the findings derived through investigations conducted by MacIntyre and Gardner[10], as well as Horwitz et al.[8, 9], which indicate that CA is distinct from other forms of anxiety, and can significantly hinder language acquisition. However, while the anxiety associated with speaking or communicating in a foreign language represents a significant barrier to effective language learning, this alone cannot be relied on to effectively evaluate the quality of language learning. CA is often not given the attention required, to assess its effect on the learners' cognitive learning strategy[47]. In a survey involving more than two thousand students, MaCroskey et al. investigated the manner in which CA establishes itself in bilingual or multilingual settings[11]. Their study focuses on the role of language as a cultural identifier, and the elevation in the level of anxiety, associated with the use of a non-native language (English). According to their findings, the impact of CA on CLS is not significant. Sarason[48] delved into the correlation between stress, anxiety, and cognitive interference, in the context of reading or processing text. According to his findings, anxiety problems stem mainly from the intrusion of task-focused thinking, by intrusive thinking. Self-focused intrusive thinking can be reduced by a task-focused experimental condition, which is an indication that the impact of CA on CLS is not palpable.

The findings derived by way of this investigation, also revealed a non-significant correlation between CN and CLS. This result is inconsistent with the result delivered in the study conducted by MacIntyre and Gardner[10], which delved into the impact of language anxiety, on the cognitive processes associated with second language learning and performance. Their findings indicate that LLA can disrupt the efficient functioning of working memory and other cognitive resources, leading to difficulties in comprehension, production, and overall language learning. Meanwhile, Perez Castillejo[49] investigated the manner in which CN and ACH are associated with second language discourse fluency, during a final examination. His findings verify the capacity of cognitive processing, to interfere with foreign language anxiety.

The findings derived through this undertaking serve to verify that LLA is negatively related to CLS. This is supported by the significantly negative effects of verbal assertiveness and AA on CLS. Communication anxiety and CN, however, do not have a significant effect on CLS.

5.2. Moderating Effect of Cognitive Learning Strategies (CLS) on the Correlation between Language Learning Anxiety (LLA) and Academic Achievement (ACH)

According to the findings acquired through this study, CLS significantly moderates the correlation between LLA and ACH. To be concise, CLS has the capacity to modify

the influence of LLA on ACH. The findings also reinforce the notion that LLA has a negative effect on ACH [1, 31–33], cognitive learning strategies (CLS) represent an intervention approach to LLA [10, 20, 31, 42], and that the relationship between CLS and ACH is positive [10, 39, 40].

5.3. Limitations of the Study

The moderating effect of CLS, on the correlation between LLA and CLS, analysed during this undertaking, was compared with the results documented in relevant literature. The questionnaire used to assess the influence of CN on CLS, CA on CLS, AA on CLS, and LC on CLS, was worded in a variety of languages, including Japanese, Korean, Arabic and Thai. However, while we strived to be meticulous in our approach, this study is not without its limitations. For instance, the sample utilized for the questionnaire survey method, comprise learners from a specific region (Anhui province of China). As such, the survey results may not be fully representative, as learners other cultural settings and learning environments are not taken into consideration. In view of this setback, future investigations in this area should expand on the diversity of the sample and include individuals from a variety of geographical regions, language backgrounds, and learning stages. This will serve to widen the applicability of the research results. Gregersen et al. [27] cites the close correlation between different data sources, to emphasize on the practicality of adopting a combination of quantitative and qualitative methods, for the study of language learners, at the individual level. Taking this view into consideration, this study recommend a combination of qualitative and quantitative methods, for impending investigations in this area. Another potential avenue for the reduction of LLA is the use of teachers as moderators, following their training in the fields of psychology and teaching strategies [50, 51]. Effiong is of the opinion that the learning anxiety of students can be lessened, through the educators' adoption of a more laidback teaching attitude. In terms of future studies, learner-external factors associated to LLA should also be taken into consideration [52].

5.4. Implications of the Study

In terms of theory and practice, the findings from studies focusing on the moderating effect of CLS on the correlation between LLA and ACH, can add to the body of knowledge relevant to language learning. In the context of language learning, the results acquired through this study, provides a better understanding of the moderating effect of CLS, on the correlation between LLA and ACH. Our investigation on the impact of different types of anxiety in a foreign language learning setting, based on existing anxiety models, delivers an explanation on the manner in which anxiety contributes to, or detracts, the learners' performance.

The findings of this study offer actionable insights for educators aiming to mitigate language learning anxiety (LLA) and enhance academic performance through cognitive learning strategies (CLS). This study tells us that in the actual educational process, we can reduce language learners' anxiety and improve their academic performance mainly through the Targeted Anxiety Interventions, the Cognitive Learning Strategy (CLS) Integration and the Classroom Environment Design, the details are as follows:

(1) Targeted Anxiety Interventions

Firstly, Language Confidence (LC): Educators should prioritize building students' LC by incorporating low-stakes speaking activities, peer feedback, and authentic language use (e.g., role-plays, cultural projects). For example, using rubrics that emphasize effort over perfection can reduce self-doubt; Secondly, Academic Anxiety (AA): Structured study skills training, such as time management and test-taking strategies, can alleviate AA. Teachers might also implement formative assessments to reduce performance pressure and provide timely feedback.

(2) Cognitive Learning Strategy (CLS) Integration

Explicitly teach CLS, such as summarization, note-taking, and self-questioning, through dedicated lessons. For instance, modeling how to use mnemonic devices for vocabulary retention can empower students to manage anxiety independently; Encourage metacognitive reflection (e.g., learning journals) to help students identify which strategies work best for them.

(3) Classroom Environment Design

Reduce Communication Apprehension (CA) by fostering a supportive classroom climate. Pair work and group projects with clear communication goals can build confidence incrementally; Address Classroom Anxiety (CN) through learner-centered approaches, such as student-led discussions and choice in assignment topics, to increase au-

tonomy and reduce fear of evaluation. For instance, teachers can place more emphasis on interactive communication and anxiety-reducing activities (such as peer cooperation, role-playing, and other anxiety-lessening communicative assignments) during the language teaching process. This will serve to minimize academic stress, increase student engagement, and enhance the students' language learning capacity.

A semester-long intervention could include weekly CLS workshops (e.g., summarization techniques) paired with anxiety-reducing activities (e.g., impromptu speaking games). Teachers could track student progress using both quantitative metrics (e.g., quiz scores) and qualitative feedback (e.g., self-reported confidence)."

5.5. Recommendations for Future Research

Based on the study's limitations and emerging insights, the following four directions are recommended:

(1) Longitudinal and Cross-Cultural Studies. For example, investigate the long-term effects of CLS training on LLA and academic performance; or replicate the study in diverse cultural contexts to validate the generalizability of findings.
(2) Mixed-Methods Exploration. For example, combine surveys with qualitative data (e.g., interviews, think-aloud protocols) to explore why CA and CN do not significantly impact CLS, despite theoretical expectations.
(3) Teacher-Led Interventions. For example, evaluate the effectiveness of teacher training programs focused on anxiety reduction and CLS promotion.
(4) Technology-Enhanced Learning Tools. For example, explore AI-driven platforms that personalize CLS training and provide real-time anxiety management support.

Generally speaking, there are still a lot of problems to be solved and many directions to be explored in the related research. We will also continue to carry out related research, and try to provide theoretical bases and practical examples for language learners to reduce their language learning anxiety and improve the academic performance.

6. Conclusions

This study builds on the existing body of knowledge [20] regarding the impact of LLA on the foreign language learning capacity, while considering the phenomenon that people from different backgrounds and cognitive levels exhibit different CLS in the face of LLA. From an operational point of view, the study considers CLS an intermediate quantity that reflects the learners' thinking capacity, while highlighting the fact that CLS regulates different anxieties in the face of LLA. We are of the opinion that the effect of LLA on ACH is not a direct binary correlation but an indirect correlation which includes the activity of learners' 'digestion and processing', with CLS playing a moderating role in between. Our introduction of the moderating variable of CLS ensures that the effect between LLA and ACH ceases to be simple binary correspondence, but a moderated effect. During this undertaking, the study also quantified the effects of CN, CA, AA and LC on CLS, and will continue to conduct in-depth investigations in this area to deliver a clearer understanding of the correlation between LLA and ACH, as well as to promote the generation of CLS in the face of LLA.

Author Contributions

Conceptualization, F.C. and X.D.; methodology, F.C and X.D.; software, X.D.; validation, X.D., and F.C.; formal analysis, X.D.; investigation, Z.Y.; resources, Z.Y.; writing—original draft preparation, F.C and X.D.; writing—review and editing, F.C and X.D.; supervision, F.C.; project administration, X.D.; funding acquisition, F.C. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement

Not applicable.

Informed Consent Statement

Ethics approval for this study was obtained from the Institutional Review Board of Anhui International Studies University under project number Awkward202403. Informed consent was obtained from all individual participants included in the study.

Data Availability Statement

Some or all data, models, or code generated or used during the study are available from the corresponding author upon request.

Conflicts of Interest

There are no conflicts of interest involved in this research. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

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