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The mediating role of emotion regulation in the link between personality traits and self-regulated learning among low-achieving EFL learners

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This study investigates the mediating role of emotion regulation in the relationships between three personality traits (conscientiousness, extraversion, and neuroticism) and self-regulated learning (SRL) among low-achieving EFL learners. A survey involving 424 learners was conducted in Chinese IELTS learning contexts, and PLS-SEM was used to assess both direct and indirect effects. The results revealed that emotion regulation positively mediated the relationship between conscientiousness and SRL, as well as extraversion and SRL, indicating that learners with higher levels of these traits tended to better regulate their emotions, thereby enhancing their SRL. However, while both neuroticism and emotion regulation independently affected SRL, no mediating effect was found for emotion regulation between neuroticism and SRL. These findings highlight the significance of personality traits in shaping SRL among low-achieving students in EFL settings. The study further highlights the need for differentiated instructional strategies aimed at strengthening emotion regulation and fostering effective SRL behaviours among this learner population.

Keywords Personality traits, Low-achieving students, EFL learning, Self-regulated learning, Emotion regulation

The acquisition of English as a foreign language (EFL) has been a central focus in many Asian countries to enhance global competitiveness. To ensure effective EFL learning, numerous studies have examined its contributing factors, among which self-regulated learning (SRL) has been identified as a strong predictor[1,2]. SRL refers to a complex process in which learners actively employ strategies such as goal setting and task-related strategies to achieve their objectives[3]. Especially, SRL can be important for EFL development in two respects. First, by emphasizing learner responsibility and fostering autonomy, SRL enables students to sustain effort in the demanding and detail-oriented process of foreign language learning[4]. Second, because EFL development requires diverse knowledge (e.g., listening and speaking), language-related skills (e.g., inferring meaning while reading), and abilities such as persistence when facing challenges, SRL helps learners select and regulate language learning strategies in a goal-oriented manner until their goals are achieved. Despite its importance, studies indicate that students in Asia whose English performance was lower often display limited use of SRL[5,6], which hinders their foreign language development[7]. This highlights the need to strengthen their SRL effectiveness in order to improve their EFL learning outcomes.

In EFL learning, SRL is widely explored through SRL use of cognitive and metacognitive strategies[1,2]. Cognitive strategies involve task-focused approaches such as vocabulary memorization, while metacognitive strategies include goal setting and self-monitoring. Research has consistently shown that these two dimensions are positively associated with EFL performance[7,8], indicating that learners who effectively self-regulate their cognition and metacognition are more likely to achieve better outcomes. Beyond these dimensions, in SRL theory, emotion regulation, defined as self-regulatory efforts to maintain positive emotions and minimize negative ones, is considered as a foundational component that supports the effective implementation of other strategies[3,9]. For most EFL students, especially struggling ones, language acquisition can be highly challenging and often trigger negative emotions such as anxiety or stress[10]. In such cases, emotion regulation strategies

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help maintain emotional balance, which further enables more effective use of cognitive and metacognitive SRL strategies[11] and ultimately supports better language acquisition.

Moreover, while the impact of individual differences on SRL is widely acknowledged[12], EFL research has primarily focused on motivational factors[7,8] such as self-efficacy, goal orientation, and task value, with relatively little attention given to personality, which is described as "a model of a person"[13]. According to trait theory, individuals with different personality traits tend to exhibit distinct behavior patterns across different contexts[13]. For example, in the EFL field[12], 's meta-analysis of 31 studies shows that highly conscientious students tend to be goal-oriented, using various strategies to support their EFL development, while extraverted learners facilitate learning by seeking feedback through social interactions. Building on this, it is plausible that EFL students with different personality profiles may vary in their SRL strategy use, with such effects potentially shaped through emotion regulation. Despite these insights, the interplay between personality, emotion regulation, and SRL remains largely unexplored in the EFL field, particularly among struggling learners, highlighting a gap for further research.

To address this, the present study explores the mediating role of emotion regulation in the relationship between personality traits and SRL strategy use among low-achieving EFL learners in China. This study defines low-achieving EFL learners as students whose English performance was lower than expected standards. To operationalize this group, learners with an overall IELTS score below Band 6 (1–5.5.5) are classified as low achieving. This threshold is appropriate because: (a) in China, such scores represent roughly the lower third of IELTS test-takers[14]; (b) IELTS band descriptors indicate that learners below Band 6 face notable linguistic challenges across four subskills, such as making consistent grammatical mistakes when speaking or not being able to use complex structures in writing[14]; and (c) Band 6 is widely regarded as the minimum requirement for study in English-speaking countries, as scores below this level suggest insufficient linguistic ability to study and live effectively in such contexts[15,16].

Compared with higher-achieving learners, low-achieving students typically exhibit weaker grammar, limited vocabulary, and more frequent errors in core language skills[14]. Given this, these students empirically experience more emotional challenges (e.g., learning stress or anxiety)[10,11] and demonstrate limited SRL strategy use[5,6], which further hinders their comprehensive EFL acquisition[17]. By examining how personality traits shape SRL through the mediating role of emotion regulation, the present study aims to provide insights for personalized instructional support that can enhance emotion regulation and further foster cognitive and metacognitive SRL strategy use, which in turn can improve EFL learning outcomes among low-achieving learners.

Literature review and hypothesis development

The impact of personality traits on SRL in the EFL field

To explore personality traits, this study adopts the Five-Factor Model of Personality (FFM), given its wide validation in conceptualizing personality in the field of education[18]. The full spectrum of the FFM comprises five traits: conscientiousness (featured by goal orientation and self-discipline), openness to experience (featured by curiosity and imagination), extraversion (featured by sociability), agreeableness (featured by empathy and cooperation), and neuroticism (featured by emotional instability). Specifically, this study focuses on conscientiousness, extraversion, and neuroticism but excludes openness and agreeableness for three reasons. First, conscientiousness, extraversion, and neuroticism are closely related to the EFL learning process and its effectiveness. For instance, conscientious learners, with strong organisation and self-control, often engage in systematic practices like vocabulary memorisation and grammar note-taking, which can directly enhance language outcomes[5]. Extraverted students, who are usually more outgoing and social, are more inclined to participate in speaking activities and thus support oral English development[5]. In contrast, neurotic learners, prone to anxiety and self-doubt, may struggle with engagement and persistence in the demanding process of EFL learning[19]. Second, prior research has identified these three traits as significant predictors of EFL performance[5,20]. Third, openness to experience and agreeableness are less relevant to core EFL learning tasks. Specifically, openness to experience, which emphasises imagination and novelty, is more strongly associated with creativity-oriented domains such as art or literature[21], rather than with the sustained effort and persistence required in EFL learning. Similarly, agreeableness, which reflects interpersonal harmony, appears to be less directly relevant to core EFL tasks that rely heavily on individual efforts (e.g., vocabulary acquisition and reading comprehension). Also, empirical studies have also suggested that openness and agreeableness demonstrate weaker or inconsistent associations with EFL effectiveness[5]. Given these considerations, the present study focuses on exploring conscientiousness, extraversion, and neuroticism as the key personality traits influencing the EFL learning process.

As discussed in the introduction earlier, the SRL process of this study would be conceptualized through students' cognitive and metacognitive strategy use given their crucial and beneficial roles in shaping students' EFL learning process[1,2]. Specifically, to examine students' cognitive SRL, this study focuses on task-related strategies such as rehearsal and memorization of English words, as they are considered fundamental abilities for EFL proficiency development[22]. In addition, to explore students' metacognitive SRL, the study employs goal setting as a typical strategy due to its particular relevance in EFL learning. As this process is typically long-term and gradual, setting clear goals can help EFL learners maintain direction and monitor their progress, thereby contributing to successful learning outcomes. Empirical studies have also indicated that such strategies are positively associated with improvements in EFL learning[1].

The positive impact of conscientiousness on students' SRL has been consistently identified in academic settings[23,24]. Previous studies commonly reveal that the goal-oriented and organized nature of conscientious students aligns closely with the essence of SRL (i.e., actively applying strategies to achieve learning goals). However, this relationship remains underexplored in EFL contexts. One relevant study was conducted by[6] who investigated the impacts of grit, self-efficacy, and intrinsic motivation on SRL among the 723 EFL pupils in Hong

Kong. Their findings indicated that grit was the strongest predictor of SRL across both male and female students. Since grit, defined as perseverance in sustained effort, shares conceptual similarities with conscientiousness, particularly in its emphasis on diligence and persistence[25], it is reasonable to expect that higher conscientiousness would similarly facilitate SRL. This may be especially relevant for low-achieving EFL learners, whose SRL deficits often stem from weaker persistence and motivation[6]. Accordingly, conscientiousness, with its strong association with effort regulation and determination, could play a critical role in enabling these learners to engage more effectively in SRL. Thus, the following hypothesis is proposed:

H1: Conscientiousness significantly predicts SRL strategy use among low-achieving Chinese EFL learners.

While research examining the impact of extraversion on SRL remains limited in EFL contexts, previous non-EFL studies have revealed its positive effects[26,27]. In the general learning context, extraverted learners are often reported to benefit from collaborative settings, where their social tendencies help them engage with SRL strategies and accomplish learning goals[20]. Some evidence in the EFL context also points to this connection. For example[28], found that compared with introverted students, extraverted students used more cognitive strategies, such as memorization through social interactions, and were more likely to set learning goals (i.e., metacognitive dimension). Likewise[29], 's study shows that extraverted Turkish EFL learners performed better in productive skills, driven by their greater tendency to seek practice opportunities. These findings suggest that extraverted students tend to leverage sociability to enhance cognitive and metacognitive SRL, thus improving EFL achievement. For extraverted low-achieving learners in particular, their self-awareness of language proficiency gaps further encourages the use of SRL strategies via social interaction, which in turn facilitates EFL development. Based on this, the following hypothesis is established:

H2: Extraversion significantly predicts SRL strategy use among low-achieving Chinese EFL learners.

Among the few studies examining the impact of neuroticism on SRL in the EFL field[30], found a relatively clear negative association between neuroticism and students' SRL strategy use. Using a mixed-methods design (i.e., cross-section survey, longitudinal survey, and interviews) with 645 EFL learners in a writing context, they showed that learners high in neuroticism frequently experienced stress, anxiety, and irrational withdrawal, which hindered their use of SRL writing strategies. Although only focusing on EFL writing[30], 's study provides insights into how neuroticism, characterized by emotional instability, can disrupt SRL and impair EFL learning outcomes. Given that low-achieving EFL learners are prone to experience more language-related anxiety[31], those high in neuroticism may be especially vulnerable, with amplified negative emotions in front of linguistic challenges, which can further reduce their likelihood of SRL engagement. Thus, the following hypothesis is established:

H3: Neuroticism significantly predicts SRL strategy use among low-achieving Chinese EFL learners.

Emotion regulation as a mediator

Within the SRL framework, emotion regulation is a key component of the motivational regulation dimension and plays a foundational role in strengthening the effectiveness of other SRL dimensions[3,9]. Several EFL studies have reported that effective emotion regulation helps students maintain positive emotions such as hope and enthusiasm while reducing negative emotions like stress and anxiety, thereby enhancing SRL engagement[4,32]. For instance[32], 's quasi-experimental study compared three groups (students using cognitive and metacognitive SRL strategies, students using SRL strategies combined with emotion regulation, and students without SRL strategies) and found that the group employing both SRL and emotion regulation achieved the highest grammatical scores; this result illustrates the supportive role of emotion regulation for SRL development and improved EFL outcomes. Similarly, broader EFL research shows that positive emotions, such as hope and enjoyment, can significantly promote well-being and facilitate SRL strategy use[13,33]. Thus, emotion regulation, by fostering positive emotions and alleviating negative ones, can substantially strengthen SRL development.

As suggested by trait theory, individuals with distinct personality traits often display corresponding behavioral tendencies[13]. Although the mediating role of emotion regulation between personality traits and SRL has been rarely explored in both general learning and EFL contexts, existing evidence (i.e., will be elaborated in the following paragraphs) on the influence of personality on emotion regulation supports this potential[34–36]. Accordingly, learners with different personality traits are likely to use varying emotion regulation strategies, which in turn shape their SRL development in EFL learning.

Studies show that conscientious individuals positively impact their emotion regulation[21,3637]. further explain that this effect stems from their goal-oriented nature and strong self-control, enabling them to manage emotional fluctuations across learning situations until goals are achieved. In the EFL context[29], 's study similarly shows that students high in conscientiousness are more likely to employ affective strategies such as emotion regulation, supporting effective EFL learning engagement. These findings reflect the insights that conscientious learners adopt a problem-solving approach by using emotion regulation as an important strategy to sustain positive emotions[21], which can facilitate the SRL development[13,33]. Focusing on conscientious low-achieving EFL learners, emotion regulation may play an especially important role; their goal-oriented tendencies might increase their efforts to maintain emotional stability despite language proficiency challenges, thus ensuring effective SRL implementation. Thus, the following hypothesis is proposed:

H4: Emotion regulation significantly mediates the relationship between conscientiousness and SRL among low-achieving Chinese EFL learners.

Some studies suggest that extraverts are naturally inclined toward active emotion regulation strategies[5,2128]. found that, compared with other personality types such as conscientiousness or agreeableness, extraverts experience higher positive emotions by subconsciously regulating emotions through openly expressing negative feelings. Similarly[35], reported that extraverted students exhibit stronger self-efficacy in managing negative emotions, often through external interaction and distraction. In the EFL learning context, low-achieving extraverted learners may still face linguistic challenges that trigger stress or worry, but their tendency to regulate emotions externally can help release stress and maintain positive emotions, and thus enhance SRL engagement. Based on this, the following hypothesis is proposed:

H5: Emotion regulation significantly mediates the relationship between extraversion and SRL among low-achieving Chinese EFL learners.

Research has also linked neuroticism to reduced emotion regulation capacity, as individuals high in neuroticism tend to rely on avoidant coping strategies when facing emotional instability[21,34]. As further explained by[34], the core nature of neuroticism is the intense emotional fluctuations and the sense of helplessness, which further reduce their self-efficacy and motivation to regulate their emotions under stress. Furthermore, in the EFL context[38], found that learners high in neuroticism exhibited lower awareness of their negative emotions (e.g., stress, anxiety), resulting in ineffective regulation. Emotion regulation may be even less effective for learners who are both high in neuroticism and low in linguistic ability (i.e., low-achieving EFL students). Heightened anxiety and limited EFL skills may make it harder for them to control negative emotions and generate positive ones, which in turn can negatively impact their engagement in SRL strategies. Thus, the following hypothesis is proposed:

H6: Emotion regulation significantly mediates the relationship between neuroticism and SRL among low-achieving Chinese EFL learners.

Research gaps and the conceptual framework

Based on the literature reviews, some research gaps are identified. First, while research in general education has highlighted the positive role of personality in SRL, little is known about its influence in EFL contexts, particularly among low-achieving learners. Addressing this gap could extend the applicability of trait theory in EFL and inform more person-centred, differentiated instruction to support struggling learners' SRL development and improve their performance. Second, while SRL theory emphasizes the importance of emotion regulation on SRL and prior studies have linked personality traits to emotion regulation, little research has examined the moderating role of emotion regulation in the relationship between personality and SRL. This presents both a theoretical and empirical gap, which could also be addressed by testing its mediating role. Finally, this study broadens the population focus by investigating low-achieving EFL learners in relation to IELTS performance, a global assessment rather than a local assessment. This perspective offers more generalizable insights and contributes to a wider understanding of how personality, SRL, and emotion regulation interact in international EFL contexts.

To address these issues, this study examines the mediating role of emotion regulation in the relationship between personality traits and SRL (defined here as cognitive and metacognitive strategies) among low-achieving Chinese EFL learners. Especially, the study focuses on exploring three personality traits (conscientiousness, extraversion, and neuroticism) as separate exogenous variables. For simplicity, the conceptual framework (Fig. 1) presents personality as a general construct, but in the empirical analysis, each trait will be tested separately in individual models as the exogenous variable.

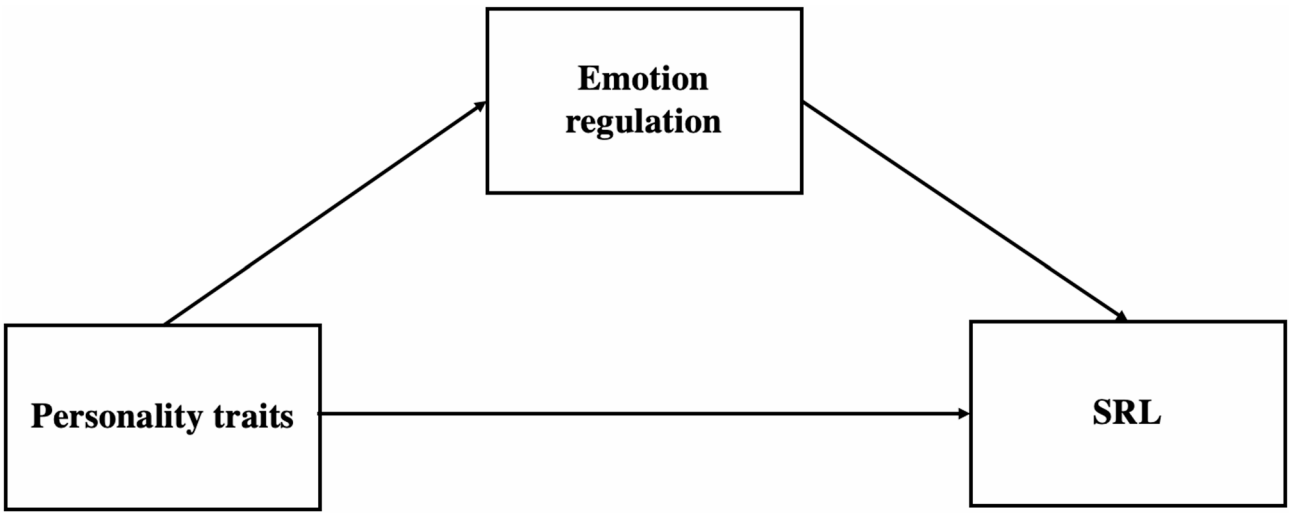

Fig. 1. The conceptual framework.

Methods

Procedures and participants

Data were collected during the fall of 2024 from two IELTS test centres in Hangzhou, China, where students were enrolled in an EFL IELTS preparation course. To specifically target low-achieving students whose overall IELTS scores are lower than Band 6 (i.e., 1–5.5.5), purposive sampling was employed. To verify students' IELTS proficiency levels, researchers collaborated with IELTS tutors to administer the IELTS tests and graded them accordingly.

The survey took approximately 10–15 min to complete. In total, 447 responses were collected; however, 23 responses were removed due to incompleteness or suspicious response patterns. The final sample consisted of 424 students preparing for the IELTS exam as part of their EFL studies. The sample comprised 238 male and 186 female students. In terms of age distribution, 384 students were between 18 and 25 years old, 80 were between 26 and 35, and 3 were between 36 and 49. Their experience with the IELTS test varied, with the number of prior attempts ranging from 1 to 7.

All the procedures and methods in this study were conducted in line with the principles of the Declaration of Helsinki. Prior to the study ethical approval was granted by the Institutional Review Board (IRB) of Universiti Malaya (Date: 1. August, 2024/No. UM.TNC2/UMREC_3676). Participation in the study was voluntary, and written informed consent was obtained from all participants. During the whole study, their right to withdraw from the survey at any time was emphasised. Participants' personal information was kept strictly confidential and used solely for research purposes.

Measures

Personality

Students' levels of conscientiousness, extraversion, and neuroticism were measured using the Big Five Inventory[18], a widely validated scale in educational research[39,40]. The assessment employed a 5-point Likert scale, consisting of 9 items for conscientiousness, 8 for extraversion, and 8 for neuroticism. Sample items include "I see myself as someone who does a thorough job" (conscientiousness), "I see myself as someone who is full of energy" (extraversion), and "I see myself as someone who is depressed, blue" (neuroticism).

Emotion regulation

Students' use of emotion regulation was measured using 3 items adapted from[9]'s self-developed SRL scale for EFL writing. This 5-point Likert scale was chosen due to its applicability to the EFL learning context and its strong validation in educational studies[30,33]. Items were adapted for the IELTS learning context; for example, "I tell myself to keep on IELTS learning when I want to give it up" replaced the original "I tell myself to keep on writing when I want to give it up."

SRL

Building on the literature review, this study examines students' use of task strategies and goal setting to explore how they self-regulate from cognitive and metacognitive perspectives in the IELTS learning context. Accordingly, the study adapted 10 items from[41], originally developed for Chinese EFL writing students regarding their SRL strategy use. This scale has also been validated in some studies in the Chinese EFL context[4], which offers a robust measure for assessing self-regulated learning in this context. Items were modified for IELTS relevance; for example, "I review the cards of new words in order to memorise them in IELTS test preparation" replaced the original item. Responses used a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree).

Data analysis

The six research hypotheses were tested using Partial Least Squares Structural Equation Modelling (PLS-SEM) via Smart PLS 4 for two main reasons. First, PLS-SEM is well-suited for handling complex relationships[42], including mediation and moderation analyses, making it an appropriate choice given the study's research aims. Second, although the skewness and kurtosis values for the key constructs fell within the acceptable range of −2 to + 2, suggesting an approximately normal distribution, the Kolmogorov-Smirnov (KS) test indicated a violation of normality, with p-values below 0.05[43]. The relevant results are presented in Appendix A. To ensure robustness, this study adopts PLS-SEM, a non-parametric statistical approach that does not assume normality in data distribution to perform data analysis[43].

Preliminary raw data were collected and cleaned using SPSS 27 by screening for missing values, suspicious response patterns, and outliers. As mentioned earlier, 23 cases that did not meet the inclusion criteria were removed, resulting in a final sample of 424 for the main analysis. The data were then assessed for reliability and validity, including convergent and discriminant validity, with results presented in the next section. Finally, PLS-SEM was used to examine the mediating role of emotion regulation in the relationships between conscientiousness and SRL, extraversion and SRL, and neuroticism and SRL.

Results

The reliability and validity test of the measurement models

Table 1 presents the factor loadings, Cronbach's alpha, composite reliability, and AVEs for each construct of interest. All item factor loadings exceeded 0.6, surpassing the recommended threshold of 0.4, which demonstrates strong indicator reliability[43]. Regarding reliability assessment, Cronbach's alpha values of all constructs ranged from 0.786 to 0.892, while composite reliability values ranged from 0.790 to 0.903. As both exceed the recommended threshold of 0.7, these results indicate satisfactory internal consistency reliability[44].

	Factor loading	Cronbach's alpha	Composite reliability	Average variance extracted (AVE)
Emotion regulation	0.812–0.864	0.786	0.790	0.700
SRL	0.654–0.737	0.889	0.893	0.501
Conscientiousness	0.663–0.808	0.884	0.902	0.515
Extraversion	0.685–0.768	0.865	0.881	0.510
Neuroticism	0.721–0.770	0.892	0.903	0.566

Table 1. Reliability and convergent validity of measurement constructs.

	1	2	3	4	5
Conscientiousness[1]					
Extraversion[2]	0.187				
Neuroticism[3]	0.074	0.072			
Emotion regulation[4]	0.208	0.175	0.060		
SRL[5]	0.183	0.206	0.231	0.413	

Table 2. Heterotrait-Monotrait ratios of correlations for key research variables.

Lastly, the AVE values for all constructs, ranging from 0.501 to 0.700, exceeded the threshold of 0.5, indicating satisfactory convergent validity for each construct[42].

To assess the discriminant validity of the key variables, Heterotrait-Monotrait Ratio of Correlations Analysis (HTMT analysis) was conducted, and the results are presented in Table 2. As shown, all HTMT values range from 0.060 to 0.413, which are below the benchmark of 0.85[42]. These findings indicate that the five research constructs (i.e., conscientiousness, extraversion, neuroticism, emotion regulation, and SRL) are distinct from one another, confirming discriminant validity[42].

Mediation analysis

This study tested six hypotheses with the primary aim to examine whether emotion regulation mediates the relationships between conscientiousness and SRL, extraversion and SRL, and neuroticism and SRL (see illustrations in Figs. 2, 3 and 4). Before conducting the SEM analysis, collinearity among predictors was assessed. As reported in Appendix B, Variance Inflation Factor (VIF) values for emotion regulation, conscientiousness, extraversion, and neuroticism were all below 5, which indicates no multicollinearity concerns and confirms that the predictors were sufficiently independent for reliable path estimation in the SEM model[42].

The significance of each path in the SEM models was assessed using 5,000 bootstrap samples and a 95% confidence interval. Table 3 presents the path coefficients, p-values, t-values, and 95% confidence intervals. Relationships were considered statistically significant if $p < 0.05$ and $t > 1.96$[43].

Specifically, conscientiousness significantly predicts SRL directly ($\beta = 0.113$, $p < 0.05$, $t > 1.96$), with emotion regulation serving as a significant mediator in this relationship ($\beta = 0.062$, $p < 0.05$, $t > 1.96$). Since both the independent variable and the mediator positively predict SRL, emotion regulation exhibits a complementary mediation effect[45] between conscientiousness and SRL. Thus, research hypotheses 1 and 4 were both supported.

A similar but weaker complementary mediation effect of emotion regulation is observed in the relationship between extraversion and SRL. Specifically, extraversion significantly predicts SRL ($\beta = 0.144$, $p < 0.05$, $t > 1.96$), with emotion regulation significantly mediating this relationship ($\beta = 0.050$, $p < 0.05$, $t > 1.96$). Thus, research hypothesese 2 and 5 were both supported.

Table 3 also shows that emotion regulation does not mediate the relationship between neuroticism and SRL ($p > 0.05$, $t < 1.96$), thus rejecting research hypothesis 6. However, research hypothesis 3 was supported as neuroticism significantly predicted SRL ($\beta = -0.222$, $p < 0.05$, $t > 1.96$).

Table 4 presents the explanatory and predictive power of the predictors on SRL. According to[42], an R^2 value of 0.75, 0.50, and 0.25 indicates high, moderate, and small explanatory power, respectively. Additionally, a Q^2 value greater than 0 suggests that the model has predictive power, with higher values indicating stronger predictive relevance. Specifically, in the conscientiousness ◊ emotion regulation ◊ SRL model, predictors collectively explained 13.8% of the variance in SRL ($R^2 = 0.138$), with significant yet weak predictive power ($Q^2 = 0.065$). Similarly, the extraversion ◊ emotion regulation ◊ SRL model accounted for 14.6% of SRL variance ($R^2 = 0.146$), with significant predictive power ($Q^2 = 0.068$). Although both models show small explanatory power, this is acceptable in social science, where learning behaviours like SRL are shaped by multiple internal and external factors.

However, as the emotion regulation did not mediate the relationship between neuroticism and SRL, the explanatory power is primarily attributed to the direct effects of neuroticism ◊ SRL and emotion regulation ◊ SRL, explaining 17.2% of the variance in SRL ($R^2 = 0.172$) with neuroticism also showing predictive power ($Q^2 = 0.082$). While small, these results still yield valuable insights into how personality traits influence SRL.

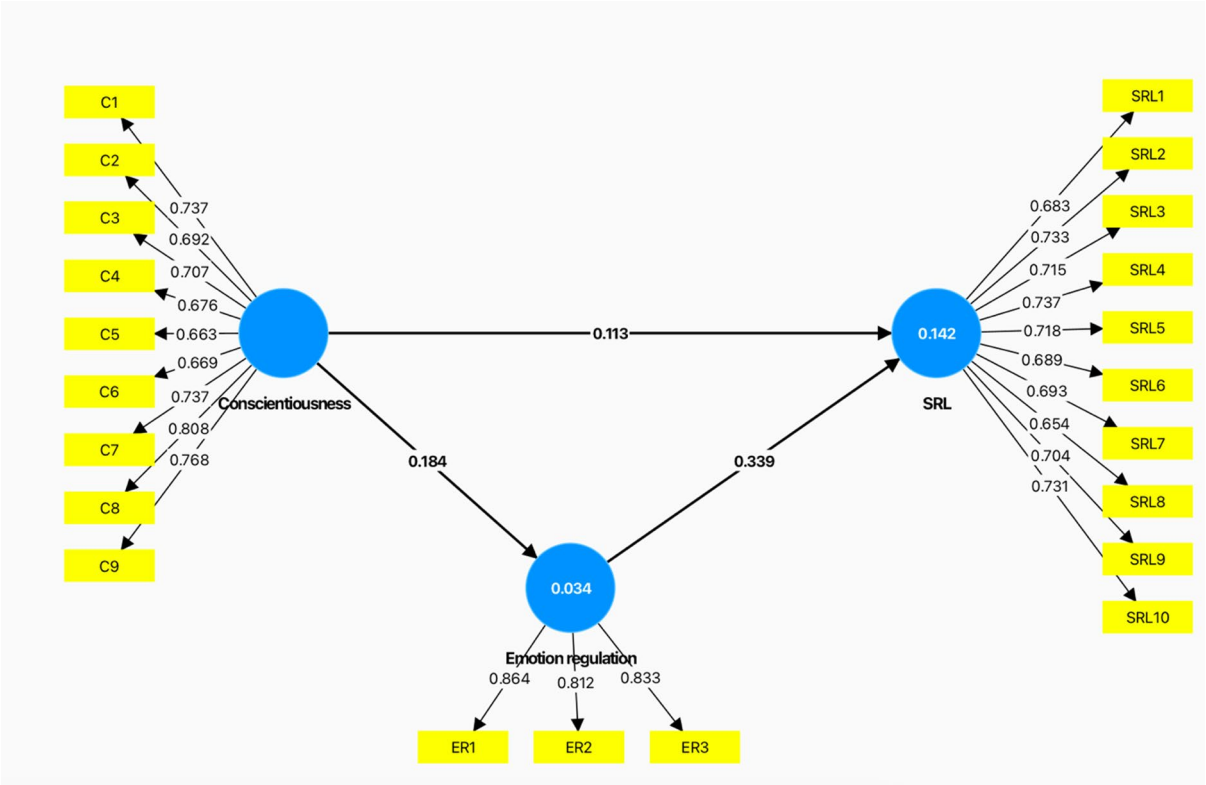

Fig. 2. Structural model of emotion regulation mediating the relationship between conscientiousness and SRL.

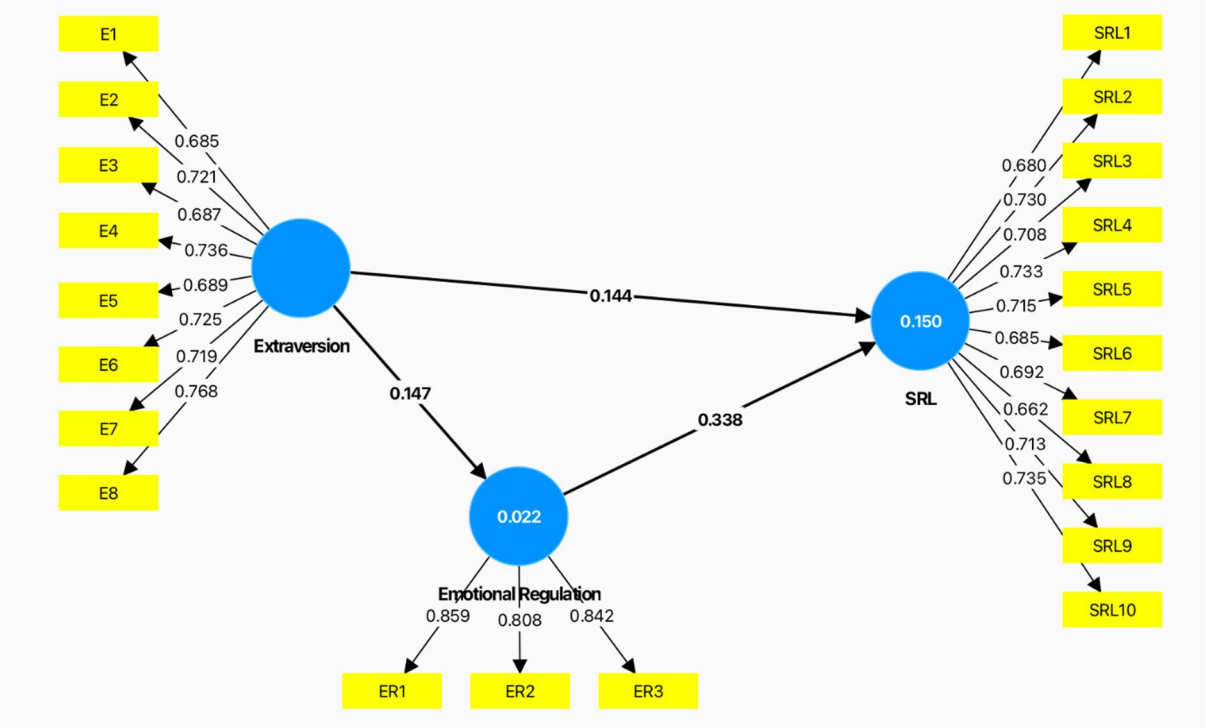

Fig. 3. Structural model of emotion regulation mediating the relationship between extraversion and SRL.

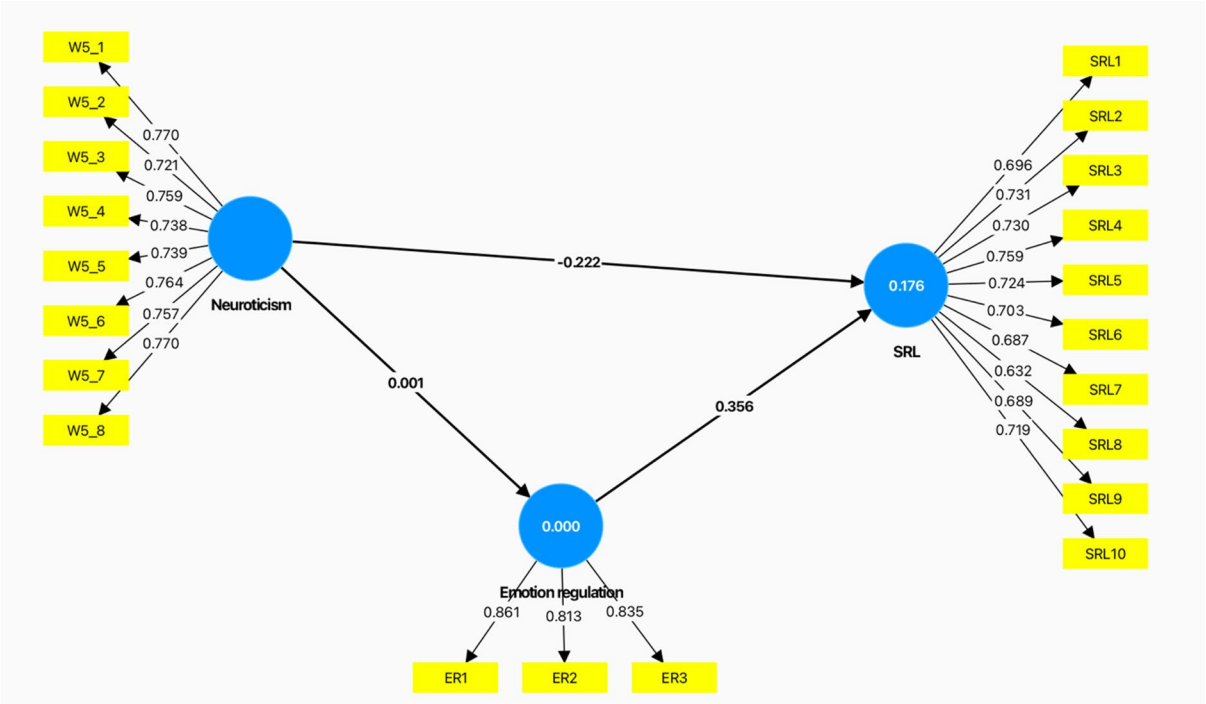

Fig. 4. Structural model of emotion regulation mediating the relationship between neuroticism and SRL.

	Path coefficients (β)	T value	*P* value	Confidence intervals 95%
The model of conscientiousness ➔ emotion regulation ➔ SRL				
C◊ ER	0.184	3.848	0.000	[0.095–0.285]
C◊SRL	0.113	2.433	0.015	[0.026–0.209]
ER◊SRL	0.339	7.385	0.000	[0.251–0.433]
C◊ER◊SRL	0.062	3.403	0.001	[0.031–0.104]
The model of extraversion ➔ emotion regulation ➔ SRL				
E◊ER	0.147	2.914	0.004	[0.053–0.253]
E◊SRL	0.144	3.091	0.002	[0.054–0.240]
ER◊SRL	0.338	7.703	0.000	[0.254–0.426]
E◊ER◊SRL	0.050	2.561	0.010	[0.017–0.095]
The model of neuroticism ➔ emotion regulation ➔ SRL				
N◊ER	0.001	0.015	0.988	[−0.105–0.108]
N◊SRL	−0.222	5.070	0.000	[−0.314–0.147]
ER◊SRL	0.356	8.221	0.000	[0.275–0.445]
N◊ER◊SRL	0.000	0.014	0.989	[−0.040–0.040]

Table 3. Path coefficients and mediation effects of emotion regulation in the relationship between personality traits and SRL. Note: C = conscientiousness, E = extraversion, N = neuroticism, ER = Emotion regulation, and SRL = self-regulated learning.

	R^2	Q^2
Conscientiousness ➔ SRL	0.138	0.063
Extraversion ➔ SRL	0.172	0.082
Neuroticism ➔ SRL	0.146	0.068

Table 4. Explanatory power (R^2) and predictive relevance (Q^2) of the structural models for SRL.

Discussion

Overall, the findings supported Research Hypotheses 1–3, thus providing empirical evidence for the trait theory[46] by revealing that different personality traits (conscientiousness, extraversion, and neuroticism) directly influence SRL strategies. Moreover, the direct influences of emotion regulation on SRL strategies across all models align with the SRL theory, highlighting its critical role in optimising SRL processes[3].

More importantly, this study identifies emotion regulation as a crucial mediator in shaping how conscientious and extraverted students engage in their SRL, suggesting that personality-SRL relationship is not purely dispositional but also influenced by emotion-coping capacities. Specifically, the positive mediation of emotion regulation between conscientiousness and SRL indicates that, even under pressure and with limited language proficiency, conscientious learners can regulate their emotions and engage in SRL effectively. Their strong goal orientation likely supports a problem-solving approach to emotion regulation[21], which facilitates consistent cognitive and metacognitive strategy use. While prior research has not explicitly examined this mediation, studies have highlighted strong associations between conscientiousness and emotion regulation[21,37] and emotion regulation and SRL[33,35]. These findings suggest that conscientiousness and emotion regulation together provide a positive value for promoting SRL among struggling EFL learners.

Furthermore, the study's finding that emotion regulation mediates the relationship between extraversion and SRL aligns with broader education research[21,35]. Extraverted individuals more easily establish social connections, providing them with greater opportunities to seek support from family, peers, and professionals for emotion regulation[12,28]. Given the emotional strain experienced by lower-achieving EFL learners[47], extraversion may help them regulate emotions by engaging with their social environment. This, in turn, enhances their psychological well-being and fosters greater SRL engagement.

Surprisingly, this study found that emotion regulation did not mediate the relationship between neuroticism and SRL. SEM results further indicate that neuroticism did not significantly influence students' emotion regulation. contrary to past research suggesting that neurotic individuals struggle with emotion regulation[34]. One explanation may be that persistent stress from IELTS test preparation leads lower-achieving IELTS learners to develop habitual coping strategies (e.g., adaptive or not) that override the expected influence of neuroticism. However, the reason why neuroticism does not affect emotion regulation remains unclear. Future research should examine whether neuroticism affects specific components of emotion regulation—such as cognitive reappraisal, expressive suppression, or positive emotion self-efficacy[48]—for deeper insight.

Implications

As suggested by scholars[12,46], personality traits are relatively stable and not easily altered. Since the findings and discussion suggest that emotion regulation can positively mediate the impact of extraversion and conscientiousness on SRL practices in different ways, a differentiated approach and guidance is needed for lower-achieving students with distinct personality traits in EFL learning. For conscientious students, who typically exhibit higher self-awareness of their emotional states for goal-achieving purposes[21], educators can provide structured emotion-focused reflection activities. For instance, encouraging these conscientious students to maintain regular reflective journals can help them identify emotional triggers and thus deal with and maintain healthy emotions in response to potential challenges in the SRL process, which can further facilitate the SRL engagement.

For extraverted low-achieving students who have the tendency to regulate their emotions via social relationships, educators can build supportive and collaborative sharing sessions where they can express their SRL usage challenges, share successful emotion regulation experiences, and receive emotional support from peers. Engaging in these interactions can help them regulate potentially negative emotions and maintain a positive mindset[21], thus enhancing their SRL engagement in the EFL learning process.

However, since emotion regulation fails to mediate the significantly negative impact of neuroticism on SRL strategy use among Chinese low-achieving EFL learners, educators need to be more sensitive when supporting these students' SRL development rather than simply requiring them to learn emotion regulation strategies. Given their tendency toward anxiety and emotional instability[34], teachers can prioritise reducing stress by setting concrete and achievable learning goals. Throughout the gradual goal-achievement process, these students can foster the sense of mastery experience, which can help develop their learning self-efficacy and further enhance their SRL strategy use[49,50].

Limitations and recommendations for future studies

This study has two limitations. First, focusing solely on Chinese EFL learners limits the generalisability of the findings. Since IELTS preparation is common across Asia and low-achieving learners face similar challenges, future research could include learners from diverse Asian backgrounds to better understand how personality shapes emotion regulation and SRL for struggling EFL learners.

Second, while the quantitative analysis revealed that emotion regulation did not mediate the negative impact of neuroticism on SRL, the underlying reasons remain unclear. Future research could incorporate qualitative interviews to explore this complex relationship further. This might potentially offer insights into the specific emotional and cognitive barriers that neurotic students face in SRL.

Conclusion

In conclusion, this study offers empirical support for the trait theory and SRL theory by examining how different personality traits can affect low-achieving EFL learners' SRL strategy use via their self-regulated emotion regulation. The findings indicate that conscientious and extraverted students enhance their SRL strategy use through effective emotion regulation, whereas neuroticism negatively affects SRL without mediation from

emotion regulation. Based on these, three key implications are highlighted. First, low-achieving students with conscientious or extraverted traits should receive targeted emotion regulation training to maximise its benefits and strengthen their SRL strategies. Second, neurotic students may not benefit from such training, as their reduced SRL is not mitigated by emotion regulation. Therefore, further research should explore alternative psychological or contextual mechanisms shaping the negative impact of neuroticism on SRL. This can enable more precise educational interventions. Third, given the complex and significant role of personality in SRL, future EFL studies, especially in Asian contexts, should further investigate its influence to develop more personalised and effective learning strategies.

Data availability

The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

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Author contributions

Dr. Zuwati (the corresponding author) supervised the entire study, including survey administration and manuscript development. Dong Murong (first author) was responsible for data collection and manuscript writing. Zhao Zhixin (Second author) was responsible for data analysis.
N/A.

Declarations

Competing interests

The authors declare no competing interests.

Additional information

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