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The Mediating Role of Self-Esteem in the Relationship Between Self-Regulation Skills and Academic Engagement with Learning Anxiety Among Students with Learning Disabilities

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ABSTRACT

The present study aimed to determine the mediating role of self-esteem in the relationship between self-regulation skills and academic engagement with learning anxiety among students with learning disabilities. In terms of purpose, this study was descriptive, and methodologically, it employed a correlational design based on Structural Equation Modeling (SEM). The statistical population consisted of all elementary school students in the city of Isfahan who had been diagnosed with learning disabilities during the second half of the 2025–2026 academic year. Using purposive convenience sampling, 200 students from the fourth to sixth grades were selected. The measurement instruments included the Learning Anxiety Questionnaire (Pekrun et al., 2005), the Self-Esteem Scale (Rosenberg, 1965), the Self-Regulation Skills Questionnaire (Bouffard et al., 1995), and the Academic Engagement Scale (Fredricks et al., 2004), which were administered to the selected participants. The data were analyzed using Structural Equation Modeling through SPSS version 26 and AMOS version 19. The results indicated that the direct relationships of academic engagement with learning anxiety, metacognitive self-regulation skills with learning anxiety, self-esteem with learning anxiety, and cognitive and metacognitive self-regulation skills with self-esteem were statistically significant ($p < .05$). However, the relationships between cognitive self-regulation skills and learning anxiety, as well as between academic engagement and self-esteem, were not statistically significant ($p > .05$). Furthermore, the indirect effects of cognitive and metacognitive self-regulation skills on learning anxiety through the mediating role of self-esteem were significant ($p < .05$), whereas the indirect relationship between academic engagement and learning anxiety through self-esteem was not significant ($p > .05$). Based on these findings, strengthening academic engagement, enhancing self-regulation skills, and promoting self-esteem may serve as effective strategies for reducing learning anxiety and improving the academic performance of students with learning disabilities.

Keywords: Learning anxiety, self-regulation skills, academic engagement, self-esteem, learning disabilities, students.

1. Introduction

Learning disabilities constitute one of the most prevalent neurodevelopmental disorders among school-aged children and adolescents and are characterized by significant difficulties in acquiring, organizing, and applying academic skills despite adequate intelligence, educational opportunities, and sensory functioning. These difficulties often manifest in reading, writing, mathematics, and other academic domains, creating persistent challenges that affect students' educational achievement, psychological well-being, and social adjustment (Ghai & Chopra, 2018; Jamhar et al., 2019). Students with learning disabilities frequently experience repeated academic failures, negative evaluations from teachers and peers, and a diminished sense of competence, which collectively contribute to heightened emotional distress and vulnerability to psychological problems. Among these psychological difficulties, learning anxiety has emerged as one of the most common and influential factors affecting the academic and personal functioning of students with learning disabilities (Johnson et al., 2021; Zuppardo et al., 2023).

Learning anxiety refers to a state of worry, tension, apprehension, and emotional discomfort associated with learning activities, educational tasks, and academic performance. It interferes with concentration, information processing, memory retrieval, and problem-solving abilities, thereby negatively affecting academic achievement and learning outcomes. Students with learning disabilities are particularly susceptible to learning anxiety because they often encounter repeated experiences of failure and frustration in academic contexts. These experiences may reinforce negative beliefs about their abilities and create a cycle in which anxiety further impairs learning performance, leading to additional academic difficulties and emotional distress (Jarfi, 2023; Khalifeh & Ghaltash, 2023). Research has consistently demonstrated that anxiety-related academic problems can significantly undermine students' motivation, persistence, and engagement in learning activities, emphasizing the importance of identifying the psychological and educational factors that contribute to learning anxiety (Salmani et al., 2025; Youssef & Alibraheim, 2025).

One of the most important protective factors against learning anxiety is self-regulation. Self-regulation refers to the ability of learners to actively monitor, control, and direct their cognitive, motivational, emotional, and behavioral processes in pursuit of academic goals. Self-regulated learners are capable of setting goals, planning learning

activities, monitoring their progress, evaluating outcomes, and adjusting strategies when necessary. These abilities enable students to manage academic challenges effectively and maintain adaptive functioning in educational settings (Asadi et al., 2022; Dignath & Büttner, 2018). Self-regulation encompasses both cognitive and metacognitive dimensions. Cognitive self-regulation involves the use of learning strategies such as rehearsal, elaboration, and organization, whereas metacognitive self-regulation includes planning, monitoring, and evaluating one's learning processes. Together, these dimensions facilitate effective learning and contribute to academic success.

The importance of self-regulation is particularly evident among students with learning disabilities. Because these students often encounter difficulties in organizing information, maintaining attention, and managing academic tasks, self-regulatory skills may serve as essential tools for overcoming learning barriers and enhancing educational outcomes. Johnson et al. emphasized that self-regulated learning frameworks can help students with learning disabilities reduce academic difficulties and cope more effectively with mathematics anxiety and related educational challenges (Johnson et al., 2021). Similarly, Yahyanejad et al. demonstrated that interventions designed to improve school well-being significantly enhanced academic self-regulation among students with learning disabilities, suggesting that self-regulation plays a central role in their academic adaptation and psychological adjustment (Yahyanejad et al., 2024). Studies conducted among various student populations have also indicated that self-regulated learning strategies are negatively associated with different forms of academic anxiety and positively related to educational effectiveness and achievement (Pouzideh, 2022; Youssef & Alibraheim, 2025).

Evidence further suggests that self-regulation influences learning outcomes through multiple psychological pathways. Students who possess stronger self-regulatory capacities tend to experience greater confidence in their abilities, more adaptive coping strategies, and lower emotional vulnerability when confronted with academic challenges. Self-regulatory strategies have been shown to predict effective learning behaviors and educational success across different academic contexts (Onwunyili & Ifenyinwa, 2020). Moreover, interventions focused on self-regulated learning have been associated with reductions in test anxiety and improvements in academic adjustment, highlighting the potential role of self-regulation in reducing learning-related

emotional difficulties (Khalifeh & Ghaltash, 2023; Sayadi Sofia et al., 2023).

Another key variable associated with students' academic and psychological functioning is academic engagement. Academic engagement refers to the extent to which students participate actively and enthusiastically in learning activities and encompasses behavioral, emotional, and cognitive dimensions. Behaviorally engaged students attend classes regularly, exert effort, and persist in academic tasks. Emotionally engaged students experience positive feelings toward learning and school, whereas cognitively engaged students invest mental effort in understanding and mastering academic content. Academic engagement has been recognized as a critical determinant of educational success, motivation, and psychological well-being (Abbasi et al., 2017; Tabatabaie, 2024).

Research has consistently demonstrated that higher levels of academic engagement are associated with improved academic achievement, stronger motivation, and lower levels of educational difficulties. Students who are actively engaged in learning tend to demonstrate greater persistence, resilience, and adaptive coping behaviors when facing academic challenges. Conversely, disengaged students are more likely to experience boredom, frustration, and anxiety, which may impair their educational performance (Borgonovi et al., 2023). Academic engagement is particularly important for students with learning disabilities because sustained engagement may help compensate for cognitive difficulties and promote more effective learning experiences.

Several recent studies have highlighted the importance of academic engagement in understanding students' emotional and educational outcomes. For example, Salmani et al. reported significant relationships among academic self-concept, academic engagement, and mathematics anxiety, emphasizing the role of learning strategies as mediating mechanisms (Salmani et al., 2025). Likewise, Tabatabaie identified significant structural relationships between basic psychological needs and academic engagement, suggesting that engagement serves as a critical mechanism linking motivational resources with educational outcomes (Tabatabaie, 2024). Additional evidence has indicated that academic enthusiasm and engagement are associated with social-emotional competence, psychological adjustment, and academic success across diverse student populations (Dawood Salman et al., 2024; Jung & Ryu, 2023).

Despite the established importance of self-regulation and academic engagement, the mechanisms through which these

variables influence learning anxiety remain insufficiently understood. One potential explanatory factor is self-esteem. Self-esteem refers to an individual's overall evaluation of self-worth, competence, and personal value. It is a fundamental component of psychological well-being and plays a critical role in shaping emotional reactions, motivation, and behavioral functioning. Individuals with high self-esteem generally perceive themselves as capable and worthy, whereas those with low self-esteem are more likely to experience self-doubt, insecurity, and psychological distress (Cao & Liu, 2024; Rahimi et al., 2022).

The relationship between self-esteem and anxiety has received considerable empirical support. Numerous studies have demonstrated that low self-esteem is associated with increased vulnerability to anxiety disorders, emotional difficulties, and maladaptive coping strategies. Payandeh et al. found that self-esteem significantly predicted anxiety among adolescents and that cognitive-emotional processes such as rumination contributed to this relationship (Payandeh et al., 2023). Similarly, Mateo et al. reported a significant correlation between self-esteem and anxiety among university students participating in online learning environments (Mateo et al., 2022). Cao and Liu further demonstrated that self-esteem predicts both anxiety and academic self-efficacy over time, highlighting its importance as a psychological resource in educational settings (Cao & Liu, 2024).

For students with learning disabilities, self-esteem may be especially important because repeated experiences of academic struggle often threaten perceptions of competence and self-worth. Research indicates that children and adolescents with dyslexia and other learning difficulties frequently exhibit lower self-esteem and higher levels of anxiety and behavioral problems than their peers (Zupardo et al., 2023). These findings suggest that self-esteem may function as a protective factor that buffers students against the adverse emotional consequences of learning challenges.

Several studies have proposed that self-esteem may operate as a mediating mechanism linking educational experiences and psychological outcomes. Yadi Yusefabad et al. demonstrated that self-esteem mediated the relationship between learning styles and test anxiety among secondary school students (Yadi Yusefabad et al., 2021). Similarly, Dawood Salman et al. identified self-esteem as an important moderating and explanatory factor in the relationship between academic variables and educational performance (Dawood Salman et al., 2024). These findings suggest that

self-esteem may explain how self-regulation and academic engagement influence anxiety-related outcomes.

The theoretical rationale for examining self-esteem as a mediator is supported by contemporary perspectives on self-regulated learning and psychological adjustment. Self-regulated learners are more likely to experience mastery, competence, and successful academic experiences, which contribute to positive self-evaluations and stronger self-esteem. In turn, higher self-esteem may reduce perceptions of threat, increase confidence in coping abilities, and diminish anxiety in educational contexts. Similarly, academically engaged students often experience greater achievement, satisfaction, and positive emotional experiences, all of which may contribute to enhanced self-esteem and reduced learning anxiety (Abbasi et al., 2017; Dignath & Büttner, 2018; Salmani et al., 2025).

Furthermore, broader psychological literature suggests that self-esteem is closely linked to resilience, adaptive coping, and emotional well-being. Individuals with stronger self-esteem are generally better equipped to manage stressors and maintain psychological stability in challenging circumstances (Labrague, 2021). The relationship between anxiety and self-concept has also been discussed in developmental and personality frameworks, highlighting the central role of self-evaluation processes in emotional functioning (Altmann & Roth, 2020; Rahimi Mand & Mohseni, 2023). Therefore, understanding how self-esteem operates within the network of self-regulation, academic engagement, and learning anxiety may provide valuable insights into the psychological functioning of students with learning disabilities.

Although previous studies have separately examined the associations among self-regulation, academic engagement, self-esteem, and anxiety, research integrating these variables within a comprehensive structural model among students with learning disabilities remains limited. Most existing investigations have focused on general student populations, test anxiety rather than learning anxiety, or isolated relationships among variables. Consequently, there remains a need to examine simultaneously the direct and indirect relationships among cognitive and metacognitive self-regulation skills, academic engagement, self-esteem, and learning anxiety in students with learning disabilities. Such an investigation may contribute to both theoretical understanding and practical intervention development aimed at improving educational and psychological outcomes for this vulnerable population.

Therefore, the present study aimed to determine the mediating role of self-esteem in the relationship between self-regulation skills and academic engagement with learning anxiety among students with learning disabilities.

2. Methods and Materials

2.1. Study Design and Participants

In terms of objectives, the present study was applied, and in terms of data collection method, it was a descriptive-correlational study based on Structural Equation Modeling (SEM). Self-regulation skills and academic engagement were considered predictor variables, self-esteem was considered the mediating variable, and learning anxiety was considered the criterion variable. The statistical population of the present study included all elementary school students in the city of Isfahan who had been diagnosed with learning disabilities during the second half of the 2025–2026 academic year. Using purposive convenience sampling, 200 students from the fourth to sixth grades were selected.

The implementation procedure was as follows: after obtaining the necessary permissions from the Isfahan Department of Education and coordinating with the relevant elementary schools and centers, the researcher visited the selected schools during the second half of the 2025–2026 academic year. First, students diagnosed with learning disabilities were identified based on their educational records, teachers' opinions, and confirmation by the relevant specialists. Then, from among the eligible students, 200 students from the fourth to sixth grades of elementary school were selected using purposive convenience sampling. Before conducting the study, the purpose of the research was briefly explained to school principals, parents, and students, and informed consent was obtained from parents for their children's participation in the study. Participants were also assured that their information would remain confidential and that the results would be reported only in the form of scientific research. After selecting the sample, the research instruments, including the Self-Regulation Skills Questionnaire, Self-Esteem Questionnaire, Academic Engagement Questionnaire, and Learning Anxiety Scale, were administered collectively in a calm environment and during appropriate instructional hours under the supervision of the researcher. In cases where students needed assistance in reading or understanding some items, the researcher or the relevant school staff provided the necessary explanations without directing the responses. Completion of the questionnaires took an average of 30 to 45 minutes.

Every study has inclusion and exclusion criteria for the statistical sample. The inclusion criteria of this study included participants' full consent to complete the questionnaires, absence of acute psychological disorders, and non-use of psychiatric medications. The exclusion criteria included unwillingness to complete the questionnaires, distorted or incomplete questionnaires, and being outside the elementary school level, specifically outside the fourth to sixth grades.

2.2. Measures

a) Learning Anxiety Questionnaire: The Learning Anxiety Questionnaire used in this study was adapted from Pekrun's Academic Emotions Questionnaire, designed by Pekrun et al. (2002, 2005). This instrument consists of 11 items, and responses are scored on a five-point Likert scale ranging from "strongly disagree" (1) to "strongly agree" (5), with higher scores indicating greater anxiety related to learning. Pekrun et al. (2002, 2005) reported Cronbach's alpha coefficients ranging from .75 to .95 for this questionnaire, indicating desirable reliability. In Iran, Kadivar et al. examined the validity and reliability of this questionnaire using Cronbach's alpha coefficient and confirmatory factor analysis. Their findings showed that the instrument had appropriate internal consistency, and the Cronbach's alpha coefficient for this subscale was .802. In addition, the validity of the questionnaire was confirmed. In the present study, the Cronbach's alpha coefficient for this questionnaire was calculated as .89, indicating acceptable reliability.

b) Self-Regulation Skills Questionnaire: This questionnaire was designed by Bouffard et al. (1995) and includes 14 items. The instrument measures two subscales: cognitive strategies and metacognitive strategies. The scoring method is based on a five-point Likert scale, such that for each item, the options "strongly disagree," "disagree," "no opinion," "agree," and "strongly agree" receive scores of 1 to 5, respectively. In the study by Jafari and Borimani (2022), the face and content validity of this questionnaire were confirmed by experts and specialists. In addition, the reliability of the instrument was assessed using internal consistency, and the Cronbach's alpha coefficient for the total questionnaire was reported as .77. In the present study, the reliability of this questionnaire was also calculated using Cronbach's alpha coefficient, which was obtained as .74.

c) Academic Engagement Questionnaire: The standardized Academic Engagement Questionnaire was designed and developed by Fredricks et al. (2004). This questionnaire consists of 15 items and three components: behavioral engagement, emotional engagement, and cognitive engagement. It measures academic engagement using a five-point Likert scale ranging from "never" = 1 to "always" = 5. The minimum and maximum possible scores are 15 and 75, respectively. Fredricks et al. (2004) reported the reliability coefficient of this scale as .86. The validity of this questionnaire was confirmed in the study by Abbasi et al. (2017), and its total reliability using Cronbach's alpha was obtained as .66. In the study by Chamani et al. (2017), the reliability of this questionnaire was reported as .92 using Cronbach's alpha. In addition, the reliability of this instrument in the study by Ganji et al. (2016) was calculated as .77 using Cronbach's alpha coefficient. The reliability coefficients of the cognitive engagement, emotional engagement, behavioral engagement, and total score scales in the study by Farajzadeh et al. (2020), using Cronbach's alpha coefficient, were calculated as .81, .78, .79, and .80, respectively. In the present study, the reliability of this questionnaire was obtained as .88 using Cronbach's alpha.

d) Self-Esteem Questionnaire: Rosenberg's Self-Esteem Scale (1965) consists of 10 items, half of which are negatively worded, for example, "I wish I could have more respect for myself," and the other half are positively worded, for example, "I take a positive attitude toward myself." Responses to the items are provided on a four-point Likert scale ranging from 1 "strongly agree" to 4 "strongly disagree." The score range of this scale varies from 10 to 40, with higher scores indicating a higher level of self-esteem (Benti et al., 2006). In the study by Alizadeh (2005), the reliability of this scale was reported as .74 using Cronbach's alpha coefficient. In addition, its test-retest reliability coefficient was obtained in the range of .82 to .88 (Alizadeh et al., 2005). In the present study, the reliability of the questionnaire was also calculated using Cronbach's alpha coefficient, which was obtained as .76.

2.3. Data Analysis

The collected data were analyzed in two sections: descriptive statistics and inferential statistics. To analyze the data, descriptive indices, including mean and standard deviation, were first calculated. Then, to examine the mediating role of self-esteem in the relationship between self-regulation skills and academic engagement with

learning anxiety, correlation analysis and Structural Equation Modeling were performed using SPSS version 26 and AMOS version 19. The significance of indirect effects was also examined using the bootstrap method.

3. Findings and Results

The demographic characteristics of the sample are presented in Table 1.

Table 1

Demographic Characteristics of the Research Sample

Demographic characteristic	Category	Frequency	Percentage	Demographic characteristic	Category	Frequency	Percentage
Father's education	Below diploma	46	23	Mother's education	Below diploma	16	8
Father's education	Diploma	53	26.5	Mother's education	Diploma	68	34
Father's education	Associate degree	50	25	Mother's education	Associate degree	30	15
Father's education	Bachelor's degree	47	23.5	Mother's education	Bachelor's degree	74	37
Father's education	Master's degree and higher	4	2	Mother's education	Master's degree and higher	12	6
Grade level	Fourth grade	44	22	Economic status	Very poor	34	17
Grade level	Fifth grade	85	42.5	Economic status	Poor	18	9
Grade level	Sixth grade	71	35.5	Economic status	Moderate	118	59
Child's gender	Boy	107	53.5	Economic status	Good	21	10.5
Child's gender	Girl	93	46.5	Economic status	Very good	9	

The descriptive findings and intercorrelations among the research variables are presented in Table 2.

Table 2

Descriptive Findings and Intercorrelations Among the Research Variables

Variable	Mean	Standard deviation	Skewness	Kurtosis	Learning anxiety	Self-esteem	Cognitive self-regulation skills	Metacognitive self-regulation skills
Learning anxiety	34.28	6.28	0.267	-0.564	—	—	—	—
Self-esteem	12.52	3.96	0.253	-0.040	-.72**	—	—	—
Cognitive self-regulation skills	20.09	5.13	-0.602	0.079	-.76**	.83**	—	—
Metacognitive self-regulation skills	20.50	4.32	-0.451	-0.177	-.63**	.73**	.84**	—
Academic engagement	42.61	9.28	0.097	0.282	-.36**	.27**	.27**	.2

To test the proposed model of the relationship between self-regulation skills and academic engagement with learning anxiety through the mediating role of self-esteem, the Structural Equation Modeling method was used. The structural model includes a set of structural equations that describe the causal relationships among variables. The proposed model of the present study includes a total of five variables, three of which are exogenous variables, one is an

endogenous variable, and one is a mediating variable. The fit of the proposed model to the data was evaluated based on goodness-of-fit indices, including chi-square as an absolute fit index, as reported in Table 3. The larger the chi-square value is from zero, the poorer the model fit becomes. A significant chi-square indicates a significant difference between the hypothesized and observed covariances. However, because the chi-square formula includes sample

size, its value becomes inflated in large samples and usually becomes statistically significant. For this reason, many researchers examine chi-square relative to its degrees of freedom, that is, the relative chi-square index (CMIN/DF) (Colquitt, 2001). In the relative chi-square index, values close to 5 or lower are conventionally considered indicative of acceptable model fit. To examine the model fit indices, several other indices were used, including the Comparative Fit Index (CFI), Parsimonious Comparative Fit Index (PCFI), Incremental Fit Index (IFI), Goodness-of-Fit Index (GFI), and Root Mean Square Error of Approximation (RMSEA). Before using Structural Equation Modeling to test the research hypotheses, the assumptions of this method were examined. These assumptions included multivariate outliers, univariate normality, and multivariate normality. To examine univariate normality, the distribution status of the observed variables in the model, namely the main research variables, was assessed using skewness and kurtosis indices. According to Kline (2016), an absolute skewness value smaller than 3 and an absolute kurtosis value smaller than 10 indicate that there is no problem with the data in terms of univariate normality (Harrington, 2012). The absolute skewness value was not greater than 3 for any variable, and the absolute kurtosis value was not greater than

10. Therefore, based on Kline's (2016) criterion, the analysis can be considered acceptable in terms of univariate normality.

To examine multivariate normality, Mardia's standardized kurtosis coefficient and the critical ratio were used. According to Blunch (2012), values smaller than 5 for the critical ratio are considered evidence of no violation of multivariate normality. If the critical ratio obtained from Mardia's coefficient is less than 5, it means that the assumption of multivariate normality has been met. In this study, Mardia's coefficient was 2.34, indicating that no outliers were observed for deletion. In addition, before entering the variables into the structural model, the measurement model was examined. The strength of the relationship between the factor, or latent variable, and the observed variable is indicated by the factor loading. Factor loading is a value between zero and one. If the factor loading is lower than .30, the relationship is considered weak and is disregarded. Factor loadings between .30 and .60 are acceptable, and if they are greater than .60, they are considered highly desirable (Kline, 1994). In the initial measurement model, the factor loadings of items 5 and 9 of self-esteem were lower than .30; therefore, these items were removed from the model.

Table 3

Goodness-of-Fit Indices of the Research Model

Fit indices	χ^2	df	p-value	CMIN/df	RMSEA	CFI	PCFI	IFI	GFI
Model indices	786.06	198	.001	3.97	.073	.927	.654	.929	.918
Acceptable value	Based on other indices	—	< .05	< 5	< .08	> .90	> .50	> .90	> .90
Status in the model	Acceptable	—	—	Acceptable	Acceptable	Acceptable	Acceptabl		

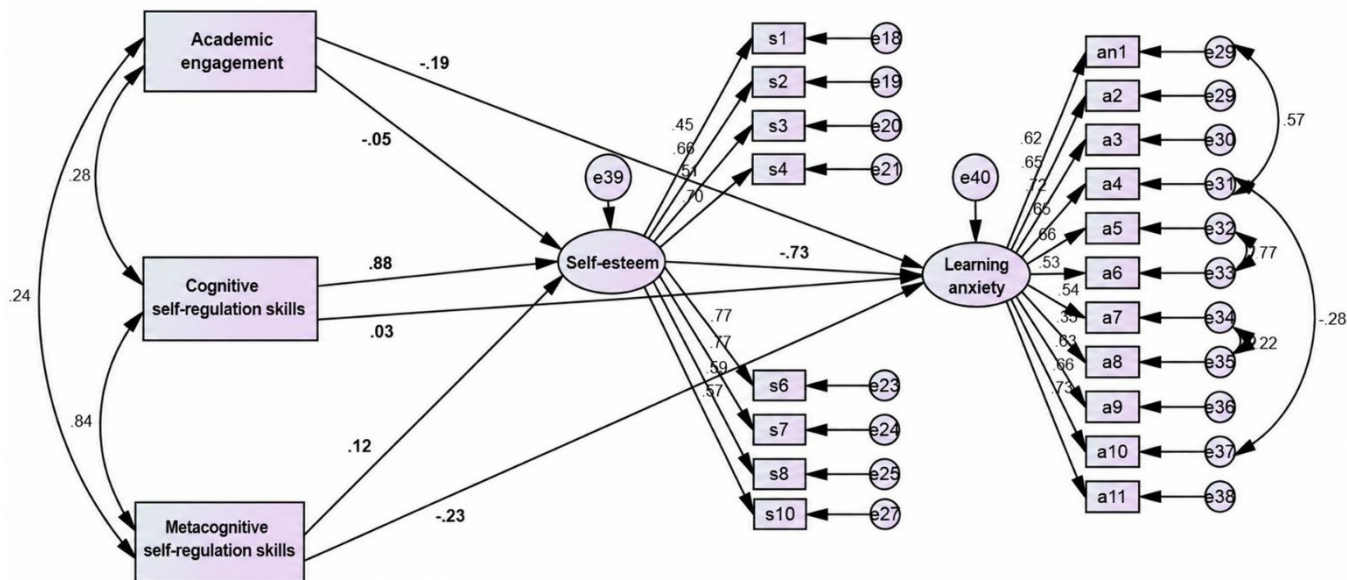
Based on the results presented in Table 3, the relative chi-square index was 3.97, which is lower than 5 and indicates that the model has an acceptable status. The values of the comparative indices IFI and CFI were higher than .90. The PCFI value, as a goodness-of-fit index, was also higher than

.50 and was desirable. The RMSEA value, as the most important overall fit index, was .073, indicating that the model generally had acceptable fit, that is, less than .08.

The Structural Equation Model of the study is presented in Figure 1.

Figure 1

Structural Equation Model of the Relationship Between Self-Regulation Skills and Academic Engagement with Learning Anxiety Through the Mediating Role of Self-Esteem



The R^2 index indicates the explained variance of endogenous latent variables. Chin (1998) described R^2 values of .60, .30, and .20 in Structural Equation Modeling as strong, moderate, and weak, respectively. The coefficient of determination for the criterion variable of learning anxiety was .80, indicating that the exogenous and mediating variables could predict 80% of the variance in learning anxiety. This value is considered strong.

To determine the significance of each mediating and indirect relationship between the independent variable and the dependent variable through the mediator, the bootstrap method was used in AMOS. The results of the direct

relationships among variables in the model are presented in Table 4, and the indirect relationships are presented in Table 5.

To examine the strength of the mediating effect in cases where mediation was confirmed, the VAF index was used. This index is calculated using the following formula: $VAF = (a \times b) / [(a \times b) + c]$. If the index is higher than .20, the strength of mediation is considered acceptable. If it is higher than .80, it indicates full mediation or a high mediation effect. If the value is between .20 and .80, the mediation is considered partial.

Table 4

Direct Relationships Obtained from Structural Equation Modeling

Independent variable	Dependent variable	Unstandardized coefficient	Standardized coefficient	Standard error	Critical ratio	Significance
Academic engagement	Learning anxiety	-0.012	-0.190	0.030	-4.16	.001
Cognitive self-regulation skills	Learning anxiety	0.040	0.033	0.031	0.12	.905
Metacognitive self-regulation skills	Learning anxiety	-0.030	-0.227	0.010	-2.81	.005
Self-esteem	Learning anxiety	-1.380	-0.728	0.120	-2.42	.010
Academic engagement	Self-esteem	-0.020	-0.054	0.010	-1.62	.105
Cognitive self-regulation skills	Self-esteem	0.052	0.876	0.080	6.73	.001
Metacognitive self-regulation skills	Self-esteem	0.090	0.123	0.040	2.08	.030

Based on the results presented in Table 4, in the Structural Equation Modeling analysis and in the presence of all variables, the direct relationships of academic engagement with learning anxiety (-.190), metacognitive self-regulation skills with learning anxiety (-.227), self-esteem with learning anxiety (-.728), cognitive self-regulation skills with self-esteem (.876), and metacognitive self-regulation skills with self-esteem (.123) were statistically significant ($p <$

.05). However, the relationships between cognitive self-regulation skills and learning anxiety (.033), as well as between academic engagement and self-esteem (-.054), were not statistically significant ($p > .05$). The critical ratios obtained for the significant paths were higher than 1.96 in absolute value, indicating the statistical significance of the direct paths.

Table 5

Indirect Relationships Obtained from Structural Equation Modeling

Independent variable	Mediating variable	Dependent variable	Unstandardized coefficient	Standardized coefficient	Standard error	Lower bound	Upper bound	Significance	VAF
Academic engagement	Self-esteem	Learning anxiety	0.002	0.039	0.038	-0.001	0.146	.058	0.16
Cognitive self-regulation skills	Self-esteem	Learning anxiety	-0.071	-0.637	0.170	-0.760	-0.080	.010	0.95
Metacognitive self-regulation skills	Self-esteem	Learning anxiety	-0.012	-0.090	0.082	-0.352	-0.008	.021	0.29

The results in Table 5 showed that the indirect effect of cognitive self-regulation skills on learning anxiety through the mediating role of self-esteem (-.071), as well as the indirect effect of metacognitive self-regulation skills on learning anxiety through self-esteem (-.012), was statistically significant ($p < .05$). As observed, zero was not included between the lower and upper bounds of the confidence intervals for these two indirect paths. However, the indirect relationship between academic engagement and learning anxiety through the mediating role of self-esteem (.002) was not statistically significant ($p > .05$). As observed, zero was included within this confidence interval. Therefore, it can be stated that self-esteem mediated only the relationship between cognitive and metacognitive self-regulation skills and learning anxiety among students with learning disabilities. Given that the VAF index for the indirect relationship between cognitive self-regulation skills and learning anxiety through self-esteem was obtained as .95, self-esteem can be considered a full mediator of this relationship. In other words, self-regulation skills do not directly affect learning anxiety; rather, these skills first influence students' self-esteem indirectly, and then, with increased self-esteem, their learning anxiety decreases. However, the VAF index for the relationship between metacognitive self-regulation skills and learning anxiety through self-esteem was obtained as .29; therefore, self-esteem can be considered a partial mediator of this relationship. This means that metacognitive self-regulation

skills indirectly affect learning anxiety, and with the inclusion of self-esteem, this relationship becomes stronger.

4. Discussion

The present study aimed to investigate the mediating role of self-esteem in the relationship between self-regulation skills and academic engagement with learning anxiety among students with learning disabilities. The findings revealed that academic engagement had a significant negative direct relationship with learning anxiety. In addition, metacognitive self-regulation skills and self-esteem were negatively associated with learning anxiety. Cognitive and metacognitive self-regulation skills were also positively associated with self-esteem. However, the direct relationship between cognitive self-regulation skills and learning anxiety was not significant, nor was the relationship between academic engagement and self-esteem. Furthermore, self-esteem significantly mediated the relationships between cognitive and metacognitive self-regulation skills and learning anxiety, whereas its mediating role in the relationship between academic engagement and learning anxiety was not supported.

One of the major findings of the study was the significant negative relationship between academic engagement and learning anxiety. This finding suggests that students with learning disabilities who demonstrate greater behavioral, emotional, and cognitive engagement in academic activities tend to experience lower levels of anxiety related to learning.

Academic engagement may reduce learning anxiety by increasing students' sense of competence, participation, and control over learning tasks. Students who are actively involved in classroom activities are more likely to perceive educational challenges as manageable rather than threatening. Consequently, they experience fewer anxious thoughts and emotional reactions when confronted with academic demands. This finding is consistent with previous research indicating that academic engagement is associated with more positive educational experiences and lower academic distress. Salmani et al. reported that academic engagement was negatively related to mathematics anxiety and played an important role in students' educational adjustment (Salmani et al., 2025). Similarly, Borgonovi et al. found that positive academic experiences and teacher enthusiasm contributed to greater engagement and reduced negative academic emotions among adolescents (Borgonovi et al., 2023). Research by Jung and Ryu also demonstrated that academic enthusiasm is positively associated with social-emotional competence and psychological well-being (Jung & Ryu, 2023). The current findings extend this evidence by demonstrating that academic engagement is an important protective factor against learning anxiety among students with learning disabilities.

Another important finding was the significant negative relationship between metacognitive self-regulation skills and learning anxiety. Students who possessed stronger abilities to plan, monitor, and evaluate their learning processes reported lower levels of learning anxiety. Metacognitive self-regulation allows learners to manage educational tasks more effectively and develop greater confidence in their ability to overcome academic challenges. When students understand how to regulate their learning processes, they are less likely to perceive academic situations as unpredictable or uncontrollable, which reduces anxiety. This finding is consistent with theoretical models of self-regulated learning that emphasize the role of metacognitive processes in enhancing academic adaptation and emotional adjustment (Dignath & Büttner, 2018). The result also aligns with studies indicating that self-regulation is negatively associated with various forms of academic anxiety. Youssef and Alibraheim found that self-regulated learning strategies were significantly related to lower statistics anxiety among graduate students (Youssef & Alibraheim, 2025). Likewise, Khalifeh and Ghaltash reported that self-regulated learning significantly predicted test anxiety among students (Khalifeh & Ghaltash, 2023). Similar conclusions were reported by Pouzideh, who

observed that self-regulated learning strategies were associated with lower levels of test anxiety in school students (Pouzideh, 2022). Therefore, metacognitive self-regulation appears to serve as a valuable psychological resource that helps students with learning disabilities manage learning-related stress and anxiety.

The findings further indicated that cognitive self-regulation skills did not have a significant direct relationship with learning anxiety. Although cognitive learning strategies such as rehearsal, organization, and elaboration are essential for information processing and academic performance, their direct influence on emotional outcomes may be weaker than that of metacognitive processes. Cognitive strategies primarily address how information is learned, whereas metacognitive strategies regulate and oversee the learning process itself. As a result, students may benefit academically from cognitive strategies without necessarily experiencing reductions in anxiety unless these strategies also contribute to improved self-perceptions and psychological resources. This finding may explain why cognitive self-regulation affected learning anxiety indirectly through self-esteem rather than directly. It also supports the argument that emotional outcomes are often influenced by higher-order self-regulatory mechanisms rather than by learning techniques alone (Dignath & Büttner, 2018; Johnson et al., 2021).

The study also demonstrated a strong negative relationship between self-esteem and learning anxiety. Students with higher levels of self-esteem reported substantially lower levels of learning anxiety. This finding highlights the importance of positive self-evaluations in protecting students against anxiety-related educational difficulties. Students who perceive themselves as competent and valuable are more likely to approach academic challenges with confidence and persistence. In contrast, students with lower self-esteem may interpret learning difficulties as evidence of personal inadequacy, which intensifies anxiety and emotional distress. The present finding is highly consistent with previous empirical evidence. Cao and Liu reported that self-esteem significantly predicted anxiety and academic self-efficacy among university students, indicating that stronger self-esteem contributes to better emotional adjustment (Cao & Liu, 2024). Similarly, Mateo et al. found a significant inverse relationship between self-esteem and anxiety among students engaged in online learning (Mateo et al., 2022). Payandeh et al. also showed that self-esteem plays a crucial role in predicting adolescent anxiety and influences

emotional functioning through cognitive processes such as rumination (Payandeh et al., 2023). The present findings support these conclusions and further demonstrate that self-esteem is particularly important among students with learning disabilities who frequently encounter experiences that threaten their sense of competence.

The positive relationships between cognitive and metacognitive self-regulation skills and self-esteem constitute another significant contribution of the study. Students who exhibited stronger self-regulatory skills reported higher levels of self-esteem. This finding can be understood within self-regulated learning frameworks, which propose that successful management of learning tasks contributes to perceptions of competence and personal effectiveness. When students are capable of organizing their learning, monitoring progress, and achieving educational goals, they experience a stronger sense of mastery that enhances self-worth. This interpretation is supported by research showing that self-regulation is associated with self-improvement, competence development, and positive self-evaluations (Asadi et al., 2022). Yahyanejad et al. also reported that interventions designed to enhance academic self-regulation among students with learning disabilities resulted in improved educational functioning and adaptation (Yahyanejad et al., 2024). Furthermore, Dawood Salman et al. highlighted the importance of emotional self-regulation and self-esteem in explaining academic performance and educational outcomes (Dawood Salman et al., 2024). Collectively, these findings suggest that self-regulatory abilities contribute not only to learning effectiveness but also to the development of positive self-perceptions.

An unexpected finding of the study was the absence of a significant relationship between academic engagement and self-esteem. Although previous research often reports positive associations between engagement and self-related constructs, the current results suggest that academic engagement may influence learning anxiety through pathways other than self-esteem among students with learning disabilities. One possible explanation is that these students' self-esteem may be shaped more strongly by long-term experiences of success, failure, and social feedback than by current levels of academic participation. Consequently, while engaged students may experience lower learning anxiety directly through increased involvement and motivation, engagement may not be sufficient to substantially alter their broader self-evaluations. This finding differs somewhat from studies emphasizing positive associations between engagement and self-concept-

related variables (Abbasi et al., 2017; Tabe Bordbar, 2024). However, it may reflect the unique psychological experiences of students with learning disabilities whose self-esteem is often influenced by multiple academic and social factors beyond classroom engagement.

The mediation analyses provided particularly important insights. The findings indicated that self-esteem fully mediated the relationship between cognitive self-regulation skills and learning anxiety. This result suggests that cognitive self-regulation skills reduce learning anxiety primarily because they enhance students' self-esteem. In other words, cognitive learning strategies alone do not directly decrease anxiety; rather, they contribute to a stronger sense of competence and self-worth, which subsequently lowers anxiety levels. This finding is theoretically meaningful because it emphasizes the central role of self-esteem as a psychological mechanism connecting learning behaviors and emotional outcomes. The result is consistent with studies demonstrating the mediating role of self-esteem in relationships involving educational and psychological variables. Yadi Yusefabad et al. found that self-esteem mediated the relationship between learning styles and test anxiety among students (Yadi Yusefabad et al., 2021). Likewise, research by Payandeh et al. highlighted the mediating processes through which self-related variables influence anxiety (Payandeh et al., 2023).

The study further revealed that self-esteem partially mediated the relationship between metacognitive self-regulation skills and learning anxiety. Unlike cognitive self-regulation, metacognitive self-regulation exerted both direct and indirect effects on learning anxiety. This finding suggests that metacognitive skills reduce anxiety through two complementary pathways. First, they directly help students manage academic demands by improving planning, monitoring, and problem-solving abilities. Second, they indirectly reduce anxiety by enhancing self-esteem. The partial mediation effect indicates that metacognitive self-regulation has broader psychological benefits than cognitive strategies alone. This interpretation is supported by the work of Johnson et al., who emphasized the importance of self-regulated learning frameworks for students with learning disabilities and anxiety-related difficulties (Johnson et al., 2021). It is also consistent with findings showing that self-regulation interventions can reduce anxiety while simultaneously enhancing self-confidence and psychological adaptation (Sayadi Sofia et al., 2023; Youssef & Alibraheim, 2025).

Finally, the mediating role of self-esteem in the relationship between academic engagement and learning anxiety was not significant. Although academic engagement directly reduced learning anxiety, its effect did not operate through self-esteem. This finding suggests that academic engagement may influence anxiety through other mechanisms, such as increased motivation, stronger school connectedness, improved academic performance, or enhanced emotional experiences in the classroom. Previous studies have shown that engagement is associated with various educational and psychological outcomes, including resilience, achievement, and social-emotional competence (Borgonovi et al., 2023; Jung & Ryu, 2023). Therefore, future investigations should examine alternative mediating variables that may explain the association between engagement and learning anxiety among students with learning disabilities.

5. Conclusion

Overall, the findings of the present study underscore the importance of self-regulation skills, academic engagement, and self-esteem in understanding learning anxiety among students with learning disabilities. The results highlight self-esteem as a particularly influential mechanism through which self-regulatory processes affect emotional outcomes. By strengthening students' self-regulatory capacities and fostering positive self-evaluations, educational systems may be able to reduce learning anxiety and improve the academic experiences of students with learning disabilities.

Several limitations should be considered when interpreting the findings of this study. First, the use of a cross-sectional correlational design limits the ability to draw definitive causal conclusions regarding the relationships among the variables. Second, the study relied exclusively on self-report questionnaires, which may be affected by social desirability bias and subjective response tendencies. Third, the sample was limited to elementary school students with learning disabilities in the city of Isfahan, which may restrict the generalizability of the findings to other age groups, educational levels, and cultural contexts. Finally, other potentially influential variables, such as parental support, teacher-student relationships, academic achievement, and specific types of learning disabilities, were not examined in the proposed model.

Future studies should employ longitudinal and experimental designs to clarify the causal relationships among self-regulation skills, self-esteem, academic

engagement, and learning anxiety. Researchers are also encouraged to investigate additional mediating and moderating variables, including academic self-efficacy, resilience, social support, school belongingness, and emotional regulation. Comparative studies involving different types of learning disabilities and diverse educational settings would further enhance understanding of these relationships. Moreover, future research should explore intervention programs specifically designed to improve self-esteem and self-regulation skills among students with learning disabilities and evaluate their long-term effectiveness in reducing learning anxiety.

Educational practitioners should prioritize the development of self-regulation skills within classroom instruction, particularly metacognitive strategies such as planning, self-monitoring, and self-evaluation. School psychologists and counselors should implement programs aimed at strengthening students' self-esteem and helping them develop more positive perceptions of their academic abilities. Teachers should create supportive and encouraging learning environments that promote active participation and academic engagement while minimizing experiences of failure and stigma. Parents should also be involved in intervention efforts by receiving guidance on how to reinforce self-confidence and adaptive learning behaviors at home. Through coordinated educational and psychological support, it may be possible to reduce learning anxiety and improve both academic performance and emotional well-being among students with learning disabilities.

Authors' Contributions

Authors equally contributed to this article.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

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