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Multigroup Analysis (MGA) of the Effect of Self-efficacy on Entrance Test anxiety by Separating Boys and Girls with the Mediating Role of Emotion Regulation

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A B S T R A C T

Purpose: Test anxiety is a prevalent and significant issue in education, and it is closely connected to the academic success and advancement of numerous students. This study aims to explore how self-efficacy influences test anxiety in both male and female teenagers while considering the role of emotion regulation as a mediator.

Methods and Materials: The research conducted was a descriptive-correlational study utilizing a cross-sectional research methodology. Structural equation modeling (SEM) and multi-group analysis (MGA) were employed. The statistical population consisted of high school students in Tehran studying experimental, mathematical sciences, and humanities between October and November 2023. A sample of 187 adolescents was selected using a multi-stage cluster sampling technique. Research instruments utilized were the General Self-Efficacy Scale (GSE-17), Test Anxiety Questionnaire (TAQ), and Cognitive Emotion Regulation Questionnaire (CERQ). Descriptive statistics were analyzed using SPSS version 27 software, while the path between variables and Multi-Group Analysis (MGA) was conducted using SmartPLS version 4 software. A p-value of 0.05 was deemed appropriate for the study.

Findings: The study findings indicate that self-efficacy had a negative and significant impact on test anxiety, mediated by the variable of other blame. However, there was no discernible distinction between the male and female groups, as shown by the minimal difference (Difference = -0.080, P = 0.604). Conversely, self-efficacy exhibited a negative and significant influence on test anxiety through the refocus on the planning variable, with a noticeable contrast between the boy and girl groups (Difference = -0.255, P = 0.020). Consequently, it can be inferred that the refocus on the planning variable may serve as a mediator solely in the male group, resulting in a decrease in test anxiety levels among boys.

Conclusion: According to the findings of this study, it is evident that both self-efficacy and emotional regulation play a role in influencing test anxiety. Therefore, it is important to consider these factors in the treatment and understanding of students' anxiety.

Keywords: *Test anxiety, Self-efficacy, Emotion Regulation, Adolescents*

1. Introduction

Anxiety, which is an unpleasant feeling that impacts a person's beliefs, attitudes, and motivations, is a natural part of life that we all experience in certain situations. Among adolescents, one common type of anxiety is test anxiety, which occurs in educational settings and leads to worries and concerns within the academic system (Habib Zadeh et al., 2024). While some level of anxiety during exams can be beneficial for increased focus, prolonged or heightened anxiety can negatively impact a student's academic performance, personality, social identity, and self-efficacy (Salari Poor et al., 2024). Test anxiety typically presents as confusion, memory issues, elevated heart rate, excessive tension, and physical arousal in some individuals before or during exams, representing a specific form of anxiety related to social phobia that causes self-doubt and reduces the ability to perform well in test situations (Ghasemi et al., 2023). Research conducted in Iran has revealed that test anxiety affects 10-30% of high school students, with global prevalence rates estimated at around 25-40%, particularly impacting female students more than male students (Rostami et al., 2024). Findings from a study suggest that higher levels of test anxiety are correlated to increased psychological rigidity and rumination (Doğan, 2024).

Multiple signs can show test anxiety in students, with self-efficacy being one of the key factors. Self-efficacy is described as a person's belief in their capabilities to complete tasks and meet obligations in different aspects of life, such as academics (Asgarshyan et al., 2023). It has been revealed in numerous studies that test anxiety can hinder individuals' performance and efficacy levels, as well as their belief in their self-efficacy (Javadi & Ghanifar, 2024). Essentially, self-efficacy refers to a person's perception of their competence and capability to navigate through life, involving the assessment of personal qualifications and the successful execution of actions to achieve desired outcomes (Khaleghi et al., 2023). Studies have demonstrated that self-efficacy can help decrease test anxiety and enhance students' sense of school belonging (Javadi & Ghanifar, 2024). Additional research suggests that teachers and school counselors have the potential to alleviate students' test anxiety by fostering academic self-efficacy (Yadi et al., 2023).

From a general point of view, it can be said that several factors play a role in the formation of test anxiety, such as how individuals control and regulate their emotions related to exams. Recognizing the methods students use to regulate their emotions could be crucial in helping them navigate through the exam experience (Hasani, 2014). Test anxiety is a complex blend of emotional reactions that can result in negative outcomes like apprehension, fear, anger, and worry (Khalili et al., 2020). Emotion regulation encompasses a range of processes that enable individuals to control their emotions, influencing what emotions they experience and how they express them. Emotion regulation is the capacity to manage or modify feelings and emotions to accomplish objectives in straightforward language (Zare Bahramabadi & Abedi, 2023). Research has shown that the use of ineffective cognitive coping skills can lead to test anxiety, whereas employing effective cognitive emotion regulation techniques is crucial in addressing test anxiety through interventions (Hasani, 2014). Furthermore, researchers have suggested that promoting academic resilience in students requires addressing family flexibility and cognitive emotion regulation (Sevari et al., 2022). Another study revealed that emotion regulation can be instrumental in reducing negative emotions and enhancing psychological well-being among students (Mirsamiee et al., 2019).

Test anxiety is a negative experience that impacts an individual's beliefs, attitudes, and motivations. High levels of test anxiety can result in negative cognitive assessment, difficulties in focus, and adverse physical, mental, and behavioral responses, leading to reduced academic performance (Mahvash et al., 2023). Therefore, it is important to explore factors that can either decrease or increase test anxiety in teenage girls and boys, given its significant detrimental effects on academic and extracurricular aspects. However, despite the importance of this issue, no studies have directly investigated the influence of self-efficacy on test anxiety in adolescent girls and boys, with emotion regulation as a potential mediator. Thus, there is a gap in research in this area, and the current study is among the first to delve into this topic, aiming to examine the impact of self-efficacy on test anxiety in teenage girls and boys and the potential moderating role of emotion regulation. The researcher has illustrated the conceptual framework of the study in Figure 1.

Figure 1

Conceptual framework of the research

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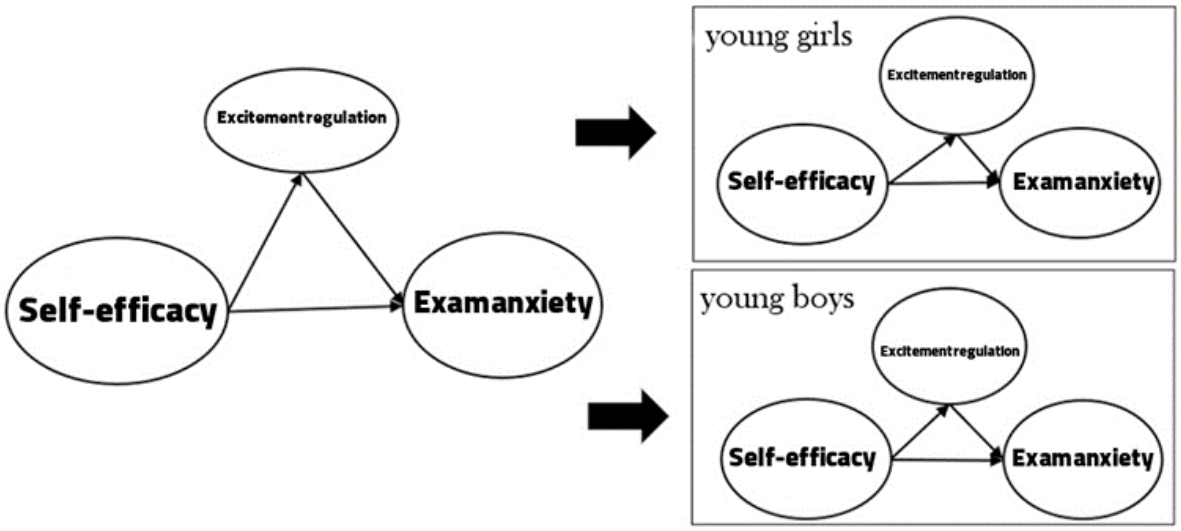

2. Methods and Materials

2.1. Study Design and Participants

This study falls under descriptive-correlational research and utilizes a cross-sectional research method, employing structural equation modeling (SEM) and multi-group analysis (MGA). The independent variable in this study was self-efficacy, the dependent variable was entrance test anxiety, and the mediating variable was emotional regulation. The statistical population for the study consisted of high school teenagers in Tehran, including both boys and girls in the fields of experimental sciences, mathematics, and humanities, during October and November 2023. The sample size for the study comprised 187 individuals selected through multi-stage cluster sampling, with 87 boys (46.5%) and 100 girls (53.5%). The sample size adequacy was determined using Cohen's formula in 2013, taking into account the number of observed and latent variables in the model, the anticipated effect size, and the desired probability and statistical power levels (Cohen, 2013). The sample size was determined using a specific formula, resulting in the calculation of various factors such as anticipated effect size=0.25, desired statistical power level=0.8, number of latent variables=3, number of observed variables=78, and probability level=0.01. Due to the high values obtained, the researcher initially selected a sample size of 119 individuals. However, in anticipation of potential attrition within the sample group, the researcher decided to increase the sample size to 200 individuals to prevent attrition. The inclusion criteria for the study specified that participants had to be pre-university level students in the local high schools, provide informed consent, possess sufficient literacy and understanding, have taken the entrance exam, and be willing to participate. Conversely, the exclusion criteria indicated that individuals with physical disorders impeding their ability to respond, those who did not answer more than 10 items in the questionnaires, and those not studying to take the entrance exam would be excluded from the study. The research methodology involved obtaining necessary permits from the university, dividing Tehran into regions, randomly selecting specific regions, identifying high schools within these regions, visiting the schools, selecting classes and students randomly, and conducting two months of research in the selected schools. In the study, 187 out of 200 distributed questionnaires were utilized, with 13 being excluded for having incomplete or intentionally inaccurate answers. The surveys were given to participants either through self-reporting or in person, following ethical guidelines that included protecting anonymity and allowing individuals to opt out of the study if they chose to.

2.2. Data Collection Tools

General Self-Efficacy Scale (GSE-17): In 1982, Sherer & Maddux developed this survey (Sherer, 1982). The GSE-17 survey assesses individuals' overall self-efficacy. It consists of 17 questions, with responses rated on a four-point Likert scale from strongly disagree to strongly agree. The scale evaluates three aspects of behavior: the initiation, the persistence, and the effort. Scores on this scale range from 17 to 68. A study conducted in Iran found the internal consistency of the survey to be 0.83 (Ahmadi Deh Ghotbaddini, 2022). Additionally, the researcher calculated Cronbach's alpha to be 0.766. The questionnaire also demonstrated a convergent validity of 0.787.

Test Anxiety Questionnaire (TAQ): The test anxiety questionnaire, developed by Sarason (1997), was designed to assess individuals' levels of test anxiety across three dimensions: social humiliation, cognitive error, and tension. The researcher has confirmed the validity and reliability of

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this scale (Sarason, 1984). There are 25 items in the questionnaire, each rated on a scale from never (0) to most of the time (3). The scores from each item are totaled to calculate the person's overall score, which falls within a range of 0 to 75. Higher scores indicate higher levels of test anxiety. A score below 12 suggests no anxiety, a score between 13 and 37 indicates moderate anxiety and a score above 63 indicates severe anxiety. The scale's reliability in Iran, based on Cronbach's alpha, is 0.84, and the questionnaire's criterion validity is 0.72 (Kareshki et al., 2017). In the current study, the questionnaire demonstrated a Cronbach's alpha of 0.766 and a Composite Reliability of 0.836. Additionally, the convergent validity AVE value was 0.787.

Cognitive emotion regulation questionnaire (CERQ): Garnefski, Kraaij, and Spinhoven (2001) developed the Cognitive Emotion Regulation Questionnaire to assess how individuals use cognitive strategies in response to stressful events (Garnefski et al., 2002). The survey includes 36 questions divided into nine categories, each category consisting of two questions. These subscales focus on self-blame (1-4 questions), acceptance (5-8), rumination (9-12), positive refocusing (13-16), refocus on planning (17-20), positive reappraisal (21-24), putting into perspective (25-28), catastrophizing (29-32), and blaming others (33-36). Every item is evaluated using a five-point rating scale from 1 (rarely) to 5 (frequently). The scores from each category are summed up to determine a total score for each person, with totals falling between 4 and 20. The reliability of the questionnaire in Iran, as measured by Cronbach's alpha, falls between 0.68 and 0.82 (Hasani, 2011). In a recent study, Cronbach's alpha coefficients for the self-blame, acceptance, rumination, positive refocusing, refocus on planning, positive reappraisal, putting into perspective, catastrophizing, and blaming others subscales were found to be 0.763, 0.715, 0.746, 0.740, 0.723, 0.795, 0.816, 0.887, and 0.804, respectively.

2.3. Data Analysis

The study utilized SPSS version 27 for descriptive statistics and SmartPLS version 4 for path analysis and Multi-Group Analysis (MGA). The normality of the distribution of research variables was assessed using the Shapiro-Wilk test, which yielded significant results, indicating that the research variables did not follow a normal distribution. Consequently, SmartPLS was chosen for the analysis. Additionally, an Independent Samples T-Test was conducted to examine group differences, with a p-value set at 0.05.

3. Findings and Results

The researcher initially analyzed the descriptive statistics of the variables being studied. All participants were in the twelfth grade and were of the same age. The mean and standard deviation of the research variables are presented in Table 1.

Table 1

Description of research variables

Variable	Groups	M	SD	Independent Samples T-Test			
				t	df	p	MD
Self-Efficacy	Man	47.966	4.926	0.305	185	0.761	0.216
	Female	47.750	4.734				
Test anxiety	Man	55.644	6.466	2.341	185	0.020	2.124
	Female	53.520	5.935				
Self-blame	Man	11.713	2.292	-1.218	185	0.225	-0.397
	Female	12.110	2.164				
Acceptance	Man	14.322	1.234	0.815	185	0.416	0.152
	Female	14.170	1.303				
Rumination	Man	11.701	2.698	-2.281	185	0.024	-0.869
	Female	12.570	2.508				
Positive refocusing	Man	10.943	2.465	-1.199	185	0.232	-0.447
	Female	11.390	2.613				
Refocus on planning	Man	11.609	2.315	-0.501	185	0.617	-0.161
	Female	11.770	2.079				
Positive reappraisal	Man	11.701	2.668	-7.079	185	< .001	-2.219
	Female	13.920	1.535				
Putting into perspective	Man	12.368	2.024	-0.519	185	0.604	-0.152
	Female	12.520	1.977				

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Catastrophizing	Man	11.241	2.579	-6.330	185	< .001	-1.969
	Female	13.210	1.622				
Other blame	Man	12.138	3.016	-1.860	185	0.064	-0.782
	Female	12.920	2.733				

In Table 1, the Independent Samples T-Test showed a significant difference between boys and girls in test anxiety, rumination, positive reappraisal, and catastrophizing variables (P<0.05). The researcher assessed the assumptions of the test and used the Shapiro-Wilk test to examine the normality of the research variables' distribution. The results showed significant non-normality for the research variables (P<0.001). The random sampling method used by the researcher met this assumption. A total of 187 participants is deemed adequate for performing the structural equation model with the partial least squares approach.

Table 2

Similarity Results with Permutation Test

Step	Step 1. Sameness	Step 2. Hybrid Matching	Step 3. Equality of Mean		Step 3. Equality of Variance	
Variable		Permutation p value	Permutation MD	Permutation p value	Permutation MD	Permutation p value
Other blame	Yes	0.030	-0.272	0.075	0.196	0.129
Catastrophizing	Yes	0.666	-0.846	0.000	0.925	0.000
Test anxiety	Yes	0.294	0.340	0.028	0.170	0.242
Positive reappraisal	Yes	0.316	-0.926	0.000	1.104	0.000
Positive refocusing	Yes	0.334	-0.176	0.234	-0.118	0.322
Acceptance	Yes	0.029	0.120	0.438	-0.110	0.510
Refocus on planning	Yes	0.012	-0.074	0.603	0.214	0.130
Rumination	Yes	0.011	-0.332	0.026	0.145	0.341
Self-blame	Yes	0.263	-0.179	0.248	0.113	0.450
Self-Efficacy	Yes	0.173	0.045	0.751	0.078	0.630
Putting into perspective	Yes	0.225	-0.076	0.604	0.045	0.746

In Table 2, the researcher examined the potential for conducting a multi-group analysis of the MICOM method using the Permutation test by investigating the similarity of means and variance among groups. The first step involved verifying if the same indicators were considered for both groups, which was confirmed by the test. The second step, Hybrid matching, indicated that only certain variables (other blame, rumination, acceptance, and refocus on planning) did not meet approval and had a significant Permutation p-value. The third step involved checking for equality of means and variance among groups, revealing discrepancies in some variables. To analyze the path between variables, the researcher utilized the Welch-Satterthwaite t-test in the PLS software. Following the model run, the researcher assessed the path coefficients and p-value between variables in Table 3. In this study, the researcher established a bootstrap value of 5000.

Table 3

Standard Research Coefficients

Path Between Variables	Path (Boy)	P-value (Boy)	Path (Girl)	P-value (Girl)	Difference (Boy - Girl)	P-value (Boy vs Girl)	Result
Other blame -> Test anxiety	0.268	0.095	0.248	0.045	0.020	0.914	rejection
Catastrophizing -> Test anxiety	0.048	0.760	0.036	0.692	0.012	0.952	rejection
Positive reappraisal -> Test anxiety	-0.059	0.607	-0.121	0.148	0.062	0.641	rejection

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Positive refocusing -> Test anxiety	-0.106	0.422	0.081	0.478	-0.187	0.279	rejection
Acceptance -> Test anxiety	-0.052	0.342	-0.150	0.053	0.098	0.300	rejection
Refocus on planning -> Test anxiety	-0.221	0.040	0.157	0.185	-0.378	0.019	confirmation
Rumination -> Test anxiety	0.033	0.804	0.129	0.284	-0.097	0.589	rejection
Self-blame -> Test anxiety	0.154	0.307	-0.023	0.883	0.176	0.412	rejection
Self-Efficacy -> Blame others	-0.870	0.000	-0.615	0.000	-0.255	0.000	confirmation
Self-Efficacy -> Catastrophizing	-0.798	0.000	-0.457	0.000	-0.340	0.000	confirmation
Self-Efficacy -> Test anxiety	-0.080	0.515	-0.538	0.000	0.458	0.016	confirmation
Self-Efficacy -> Positive reappraisal	0.807	0.000	0.147	0.146	0.660	0.000	confirmation
Self-Efficacy -> Positive refocusing	0.764	0.000	0.678	0.000	0.085	0.141	rejection
Self-Efficacy -> Acceptance	0.040	0.711	0.071	0.463	-0.031	0.831	rejection
Self-Efficacy -> Refocus on planning	0.662	0.000	0.693	0.000	-0.031	0.625	rejection
Self-Efficacy -> Rumination	-0.779	0.000	-0.590	0.000	-0.189	0.007	confirmation
Self-Efficacy -> Self blame	-0.721	0.000	-0.778	0.000	0.057	0.365	rejection
Self-Efficacy -> Putting into perspective	0.098	0.362	-0.047	0.629	0.146	0.320	rejection
Putting into perspective -> Test anxiety	0.020	0.713	0.011	0.891	0.008	0.933	rejection

Figure 2

Path coefficients between variables and significance level in the men's group

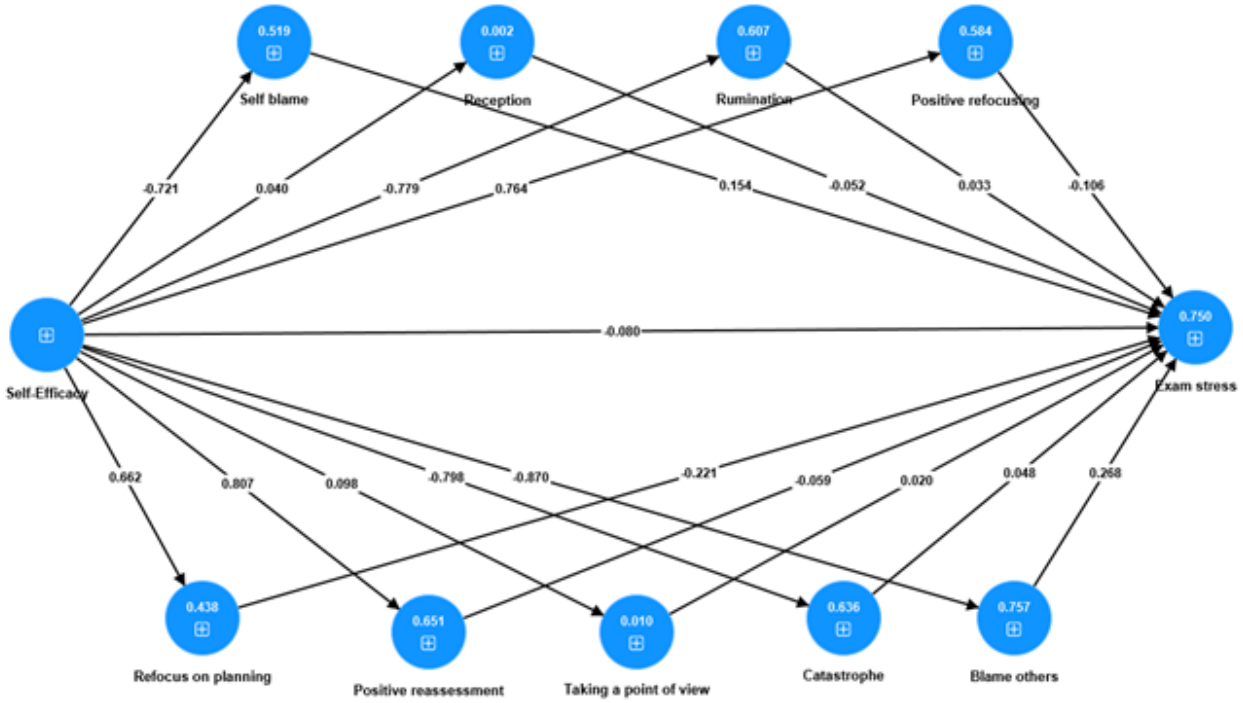

Figure 3

Path coefficients between variables and significance level in the Female's group

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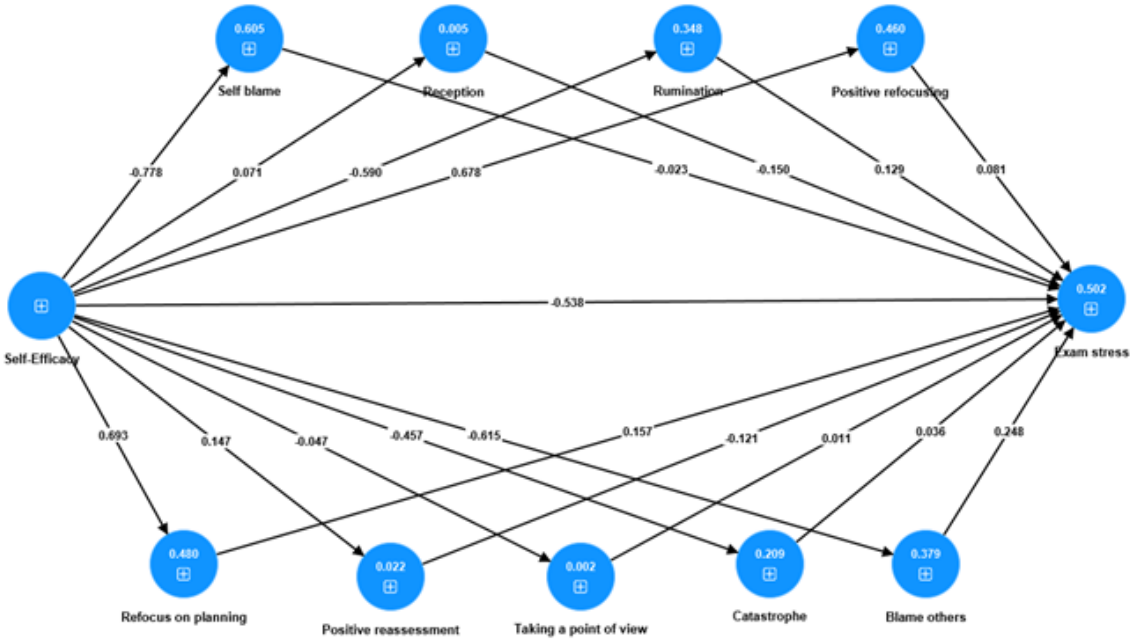

The results in Table 4 and Figures 2 and 3 indicate that self-efficacy significantly affects other blame, Catastrophizing, and test anxiety. The p-values for gender comparison and rumination were 0.000 and 0.007, respectively. The analysis of different groups showed a notable disparity between males and females, indicating that self-efficacy plays a more significant role in other blame and catastrophizing variables among boys than girls. In addition, self-efficacy only affected test anxiety in girls, and its impact on rumination was stronger in the female group. Furthermore, self-efficacy negatively affected self-blame in both male and female groups, with no significant difference observed between the two genders.

The self-efficacy factor had a positive and statistically significant direct impact on positive reappraisal, positive refocusing, acceptance, and refocus on planning. For positive reappraisal, self-efficacy was effective only in the girls' group. Similarly, for acceptance, self-efficacy was effective only in the boys' group. Putting into perspective variables did not affect test anxiety in either boys or girls. The other blame factor had a significant impact on test anxiety only in the girls' group. Refocus on planning was effective only in the boys' group, with a significant difference between boys and girls. The researcher then analyzed the indirect effects of the variables using the bootstrap method.

Table 4

Indirect effects between research variables

Path between variables	Difference (Boy - Girl)	p value (Boy vs Girl)	Result	p value (Boy)	p value (Girl)
Self-Efficacy -> Self-blame -> Test anxiety	-0.128	0.430	rejection	0.316	0.883
Self-Efficacy -> Putting into perspective -> Test anxiety	0.002	0.784	rejection	0.816	0.954
Self-Efficacy -> Catastrophizing -> Test anxiety	-0.022	0.873	rejection	0.761	0.699
Self-Efficacy -> Positive refocusing -> Test anxiety	-0.136	0.281	rejection	0.423	0.484
Self-Efficacy -> Other blame -> Test anxiety	-0.080	0.604	rejection	0.097	0.047
Self-Efficacy -> Refocus on planning -> Test anxiety	-0.255	0.020	confirmation	0.040	0.191
Self-Efficacy -> Rumination -> Test anxiety	0.051	0.690	rejection	0.805	0.284
Self-Efficacy -> Positive reappraisal -> Test anxiety	-0.030	0.794	rejection	0.612	0.386
Self-Efficacy -> Acceptance -> Test anxiety	0.009	0.648	rejection	0.807	0.538

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Based on the data presented in Table 4, it was found that self-efficacy had a negative and significant impact on test anxiety through the other blame variable, with no discernible difference between male and female participants (Difference = -0.080, P = 0.604). Additionally, there was a negative and significant association between self-efficacy and test anxiety via the refocus on the planning variable, with a noted difference between boys and girls (Difference = -0.255, P = 0.020). As a result, it can be inferred that the refocus on the planning variable may act as a mediator specifically for boys, helping to alleviate test anxiety among male students. Furthermore, the researcher analyzed the coefficient of determination for the endogenous variables in Table 5.

Table 5

Coefficient of determination of the model

	Boy		Girl	
Variables	R-square	R-square adjusted	R-square	R-square adjusted
Other blame	0.757	0.754	0.379	0.372
Catastrophizing	0.636	0.632	0.209	0.201
Test anxiety	0.750	0.718	0.502	0.447
Positive reappraisal	0.651	0.647	0.022	0.012
Positive refocusing	0.584	0.579	0.460	0.455
Acceptance	0.002	-0.010	0.005	-0.005
Refocus on planning	0.438	0.431	0.480	0.475
Rumination	0.607	0.603	0.348	0.342
Self-blame	0.519	0.514	0.605	0.601
Putting into perspective	0.010	-0.002	0.002	-0.008

The researcher checked the reliability and validity of the research model in Table 6.

Table 6

Reliability and validity of the model

Variables	Cronbach's Alpha	Composite Reliability	AVE
Self-Efficacy	0.766	0.836	0.787
Test anxiety	0.720	0.826	0.543
Self-blame	0.763	0.835	0.814
Acceptance	0.715	0.800	0.707
Rumination	0.746	0.809	0.586
Positive refocusing	0.740	0.836	0.560
Refocus on planning	0.723	0.828	0.548
Positive reappraisal	0.795	0.859	0.551
Putting into perspective	0.816	0.863	0.865
Catastrophizing	0.887	0.929	0.815
Other blame	0.804	0.856	0.592

Table 6 indicates that the model's reliability and validity have been validated. The Cronbach's alpha reliability for the variables exceeds 0.7. The combined reliability of these variables is also above 0.7. The model's validity was assessed using the average variance extracted index, which shows values higher than 0.5 for research variables, affirming its validity. Fit of the model was also examined, confirming all fit indices. The SRMR, which measures the difference between observed and structural model correlations, was found to be 0.107 for the model.

4. Discussion and Conclusion

The main objective of the current research was to explore how self-efficacy impacts the test anxiety levels of male and female adolescents, with emotional regulation playing a role as an intermediary factor. According to the findings of this study, self-efficacy only led to increased acceptance among male participants, while it significantly decreased the

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tendencies of other blame and catastrophizing within this group. Additionally, self-efficacy was found to lower test anxiety and enhance positive reappraisal among boys, with a particularly impactful effect on reducing rumination. In terms of emotional regulation components, other blame was correlated to higher test anxiety levels in girls, whereas refocusing on planning was associated with decreased test anxiety in boys. Moreover, the self-efficacy factor demonstrated a notable negative impact on test anxiety through the other blame aspect, and the refocusing on the planning component played a mediator role among male participants by effectively reducing test anxiety.

The results of the recent research suggest that self-efficacy has an impact on reducing the tendency to other-blame, catastrophizing, rumination, and experience test anxiety, as well as increasing acceptance and positive reappraisal. These findings are consistent with earlier studies (Javadi & Ghanifar, 2024; Yadi et al., 2023; Raeisi Sarteshneizy et al., 2020; Zyberaj, 2022). One study revealed that self-efficacy can decrease test anxiety and enhance students' sense of belonging in school (Javadi & Ghanifar, 2024). Additionally, a different study suggested that academic self-efficacy promoted by teachers and school counselors can help lessen students' test anxiety (Yadi et al., 2023). Furthermore, another study found a significant association between self-efficacy in emotion regulation and emotional disturbances such as depression, anxiety, and stress (Raeisi Sarteshneizy et al., 2020). Another study demonstrated both positive and negative relationships between various emotion regulation strategies and self-efficacy beliefs. For instance, the use of reappraisal, a positive emotional regulation strategy, was correlated to higher academic self-efficacy, while different emotion regulation strategies showed mixed correlations with academic achievement (Zyberaj, 2022).

In the context of this discovery, it is important to note that girls tend to have significantly higher scores in feelings of sadness and anxiety, potentially suggesting a stronger inclination towards utilizing emotion regulation techniques when experiencing these emotions. Studies consistently demonstrate that girls typically display a broader spectrum of positive and negative internal emotions when compared to boys. Additionally, the variations in emotional expression between genders may not be inherent traits but rather influenced by complex interactions with the environment and individual factors such as age (Sanchis-Sanchis et al., 2020). Self-efficacy is important for students' success in school and life and can impact health and contribute to how individuals deal with challenges. It also plays a crucial role in managing diseases, engaging in healthy behaviors, participating in physical activities, and enhancing overall well-being. Self-efficacy refers to an individual's personal belief in their ability to address problems and achieve success. Increasing self-efficacy can help reduce negative behaviors such as blaming others, catastrophizing, rumination, and test anxiety, as well as encourage more acceptance and positive reappraisal (Asgarshyan et al., 2023).

Another discovery from the study indicated that emotional regulation can decrease test anxiety in boys but increase it in girls, aligning with prior research (Hasani, 2014; Nazari & Taghipour, 2022). The research revealed that inadequate cognitive coping contributes to test anxiety, highlighting the importance of effective cognitive emotion regulation techniques in interventions targeting test anxiety (Hasani, 2014). Another study found a strong, positive correlation between emotional regulation strategies and test anxiety scores, particularly in the areas of anxiety and excitement (Nazari & Taghipour, 2022).

Explaining this discovery requires acknowledging that biological theories regarding emotional regulation differences between men and women attribute it to genetic variances or age-related developments. Studies show that girls are more prone to displaying a wider range of emotions than boys (Sanchis-Sanchis et al., 2020). Improving emotional regulation can enhance students' ability to cope with frustration by recognizing and managing their emotions, particularly negative ones like anger, dissatisfaction, and stress. Cognitive regulation can help male students with test anxiety by enabling them to embrace a more positive mindset (Mousavi et al., 2024). Utilizing emotional regulation empowers students to control and adjust their emotions, cultivate positive feelings, enhance social communication skills, and make sound decisions under pressure. Students' interpretation of emotional arousal significantly impacts their performance and emotional well-being. Those who view negative emotions as hindrances tend to experience more anxiety, while those who can manage their emotions positively experience less anxiety (Taghipour & Razi, 2020).

This research also demonstrated that self-efficacy can help lower test anxiety by managing emotions, a finding that aligns with earlier studies (Sharma & Kumra, 2022; Asnaani et al., 2020). Another study discovered that difficulties in emotional regulation and sensitivity to anxiety play a significant role in reducing symptoms related to anxiety (Asnaani et al., 2020). Furthermore, another study revealed a negative correlation between self-efficacy and anxiety (Sharma & Kumra, 2022).

One factor that can help students manage test anxiety is having a higher sense of self-efficacy, which involves believing in one's abilities based on multiple sources of information (Khaleghi et al., 2023). Self-efficacy is an important self-regulatory mechanism that directly influences actions and contributes to cognitive, motivational,

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emotional, and deterministic factors. Adolescents face challenges like test anxiety, with multiple self-efficacy beliefs influencing both positive and negative psychosocial outcomes. Girls in adolescence and young adulthood tend to have lower levels of positive thinking and experience fewer positive emotions, while boys are more confident and experience less test anxiety due to their emotional regulation and self-regulated learning abilities (Cattelino et al., 2023).

One of the limitations of this study was the difficulty in obtaining consent from all sample individuals due to a lack of perceived benefit on their part to participate in the research and respond to the questionnaire. It is challenging to generate intrinsic motivation for every individual in all situations, and researchers and students lack the necessary resources to create extrinsic motivation. Self-reporting measurements may not always align with real-life behavior due to social desirability bias or weak introspection, potentially impacting the validity of the results. Future research could be improved by including input from both teenagers as well as parents and educators for the purpose of comparison. It is recommended to replicate this study in different communities, including those with anxiety disorders. The study's limitation of low cooperation from students, particularly during busy periods, was mitigated by clarifying the study's purpose. Variances in cultural backgrounds might influence how students experience test anxiety and emotional regulation. Not all potential influencing factors like family support, socioeconomic status, and school environment could be controlled for in this study, highlighting the need for future research to address these variables. The focus on Iranian students in this study may yield different results in other cultural and teaching settings, underscoring the importance of conducting studies in diverse populations to understand the impact of culture on test anxiety. Further research could explore additional mediating variables that play a role in students' anxiety during tests.

The current study's findings indicated that self-efficacy plays a crucial role for both male and female students, enhancing positive aspects of emotional regulation while decreasing negative aspects and test anxiety. Moreover, decreasing the tendency to blame others may help reduce test anxiety in girls, while increasing refocus on planning could be beneficial for boys. The study also found that cognitive emotion regulation mediates the relationship between self-efficacy and reduced test anxiety. These results suggest that self-efficacy and emotional regulation can impact test anxiety, underscoring the importance of addressing these factors in the treatment and management of students' test anxiety. Suggestions involve putting in place training programs focused on cognitive emotion regulation and self-efficacy for teachers, along with supplying students with educational resources to improve self-efficacy. Counseling and psychotherapy centers should also give more attention to these variables when predicting unproductive academic behaviors. Education and training should aim to strengthen students' self-efficacy through books and educational resources.

Authors' Contributions

All authors significantly contributed to this study.

Declaration

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

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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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. Each participant received an informed consent form to understand the study's objectives.

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