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The Impact of Anxiety Thoughts, Frustration Tolerance, and Learning Strategies on Test Anxiety Among Female High School Students

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A B S T R A C T

Objective: The present study aimed to examine the impact of anxiety thoughts, frustration tolerance, and learning strategies on test anxiety among female high school students in their second year.

Methods and Materials: The research was descriptive-correlational in nature. The statistical population included all female high school students in Tonekabon during the academic year 2023-2024, from which a stratified proportional sample of 341 students was selected. The research instruments included the Wells Anxiety Thoughts Index (AnTI) (1994), the Harrington Frustration Discomfort Scale (FDS) (2005), the Pintrich et al. Motivated Strategies for Learning Questionnaire (MSLQ) (1993), and the Phillips Test Anxiety Questionnaire (PAQ) (1978). The data were analyzed using structural equation modeling (SEM).

Findings: The findings indicated that anxiety thoughts have a positive and direct effect on students' test anxiety ($p < .05$). Frustration tolerance and learning strategies have a negative and direct effect on test anxiety ($p < .05$).

Conclusion: It can be concluded that anxiety thoughts, frustration tolerance, and learning strategies play a significant role in shaping test anxiety among female high school students.

Keywords: *Test anxiety, frustration tolerance, learning strategies, anxiety thoughts.*

1. Introduction

Test anxiety is a common phenomenon among students, significantly affecting their academic performance and mental health. This type of anxiety is defined as an unpleasant emotional state or worry experienced before, during, and after exams (Zhang et al., 2021). Students with test anxiety may experience physiological symptoms such as palpitations, sweating, headaches, and even nausea. Additionally, psychological symptoms like negative thoughts, severe worry, and fear of failure are prevalent in these individuals (Pouzideh, 2022). Test anxiety can lead to reduced concentration, memory impairment, and difficulties in retrieving information. This may cause students, even those who are adequately prepared, to perform poorly in

exams. Moreover, test anxiety can result in avoidance of studying and exam preparation, potentially leading to a vicious cycle (Wei et al., 2022).

Anxiety thoughts and test anxiety in students have a close and complex relationship that has attracted the attention of researchers in educational psychology. Anxiety thoughts, defined as worry about worry, can play a significant role in exacerbating test anxiety (Zhang et al., 2021). Students who experience high levels of anxiety thoughts often engage in repetitive thoughts about their worries related to exams. These individuals are not only concerned about their performance in exams but also about the worry itself and its consequences. Research has shown that anxiety thoughts can act as a mediator between trait anxiety and test anxiety (Yarmohammadi Vasel et al., 2021). Additionally, anxiety thoughts can increase students' sensitivity to anxiety symptoms, leading to the misinterpretation of normal physiological signs of stress and intensifying anxiety (Yarmohammadi Vasel et al., 2021).

Frustration tolerance and test anxiety in students also share a close and complex relationship. Frustration tolerance refers to an individual's ability to cope with unpleasant situations and setbacks without experiencing severe negative reactions. Students with low frustration tolerance generally experience higher levels of anxiety when facing academic challenges, particularly exams (Li et al., 2024). These students may find the mere thought of failing an exam intolerable, which can lead to increased anxiety and decreased performance. Studies have shown that low frustration tolerance can act as a risk factor for test anxiety. Students who are unable to tolerate frustration may exhibit more intense emotional reactions when confronted with difficult questions or stressful exam situations (Mehdipourthani et al., 2022). These reactions may include negative thoughts, severe worries, and even physical symptoms of anxiety (Redmond et al., 2023).

Learning strategies and test anxiety in students are closely related. Research has shown that effective use of learning strategies can help reduce test anxiety (Mazloumyan & Ebrahimi, 2022). Students who employ appropriate study strategies, such as summarization, concept mapping, and regular practice, generally have more confidence when facing exams and, as a result, experience less anxiety (Niromand et al., 2023). On the other hand, students with poor learning strategies often struggle with organizing and understanding the material. This can lead to increased test anxiety, as they feel less prepared to answer questions (Pouzideh, 2022). Additionally, studies have shown that teaching effective learning strategies to students can improve academic performance and reduce test anxiety (Agustin et al., 2021). Therefore, it can be said that there is an inverse relationship between the use of effective learning strategies and the level of test anxiety. The better students are able to use these strategies, the less likely they are to experience severe anxiety during exams (Feng et al., 2020).

Recent research indicates that anxiety thoughts, frustration tolerance, and learning strategies play important roles in the development and exacerbation of test anxiety in students. Anxiety thoughts, as a complex cognitive process, can create a cycle of negative thoughts that intensify test anxiety (Zhang et al., 2021). Students who experience high levels of anxiety thoughts often struggle more with stress management and maintaining focus during exams. Frustration tolerance, another important factor, affects students' ability to cope with academic challenges. Studies have shown that students with low frustration tolerance experience more anxiety when facing difficult questions or stressful exam situations (Li et al., 2024). This can lead to decreased academic performance and an increased sense of helplessness in facing challenges. Learning strategies also play a key role in reducing test anxiety. Students who use effective learning strategies generally have more confidence in their abilities and, as a result, experience less anxiety during exams (Vakili Fard, 2023). Techniques such as regular review, self-testing, and material organization can enhance mastery of academic subjects and reduce exam-related worries. Recent studies have also emphasized the importance of the interaction between these three factors (Abdollahzadeh et al., 2023).

This study addresses a significant gap in the existing literature by simultaneously examining the impact of anxiety thoughts, frustration tolerance, and learning strategies on students' test anxiety. While previous studies have examined each of these factors separately, few have investigated the interaction of these three factors and their combined effect on test anxiety. This comprehensive approach can provide a deeper understanding of the underlying mechanisms of test anxiety. The innovative aspect of this study lies in presenting an integrated model that demonstrates how these three factors interact and influence test anxiety. This model can help identify students who are at a higher risk of experiencing severe test anxiety. Furthermore, this research can lay the foundation for the development of more effective interventions to reduce test anxiety, as it considers a multidimensional approach targeting all three factors. Additionally, the findings of this study can assist teachers,

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counselors, and educational psychologists in gaining a better understanding of the factors influencing test anxiety and providing more appropriate strategies to help students. Therefore, the present study aims to examine the impact of anxiety thoughts, frustration tolerance, and learning strategies on test anxiety among female high school students in their second year.

2. Methods and Materials

2.1. Study Design and Participants

The present study was descriptive-correlational in nature. The statistical population included all female high school students enrolled in the second year of high school in Tonekabon, totaling 3,150 students during the academic year 2023-2024. According to the Krejcie and Morgan table, the sample size for the study was determined to be 341 students, who were selected using a stratified proportional sampling method from 15 female high schools in Tonekabon. The inclusion criteria for participants included being female students, studying in the third year of high school, residing in Tonekabon, and being willing to participate in the study. Exclusion criteria included non-cooperation in the study and leaving at least 5% of the questions unanswered. After selecting the sample group, questionnaires were distributed among the students, adhering to ethical research principles as follows: informed consent to participate in the research, explanation of how to respond to the questions and the importance of honest cooperation, respectful behavior and confidentiality of information, and withdrawal from the study if they did not wish to continue their participation.

2.2. Measures

2.2.1. N-Back Computerized Test

Wells Anxiety Thoughts Index (AnTI): This index was developed by Wells in 1994 and consists of 30 items and 3 factors: social worry, health worry, and anxiety thoughts. The items are scored on a four-point scale ranging from "strongly disagree" to "strongly agree". In Wells' (1994) study, the Cronbach's alpha coefficients for social worry, health worry, and anxiety thoughts were reported as .84, .81, and .75, respectively. To assess the convergent validity of the Anxiety Thoughts Index, correlations with the Beck Depression Inventory-II (BDI-II) and the General Health Questionnaire-28 (GHQ-28) were used, with the results being .45 and -.51, respectively (Wells, 1994). In Iran, Fathi et al. (2010) reported test-retest reliability over a two-month period with a reliability coefficient of .81 for the total scale and .71, .77, and .73 for social worry, health worry, and anxiety thoughts, respectively. The correlation between the Wells Anxiety Thoughts Index and the Beck Anxiety Inventory (BAI), Maudsley Obsessive-Compulsive Inventory (MOCI), and the trait subscale of the Spielberger State-Trait Anxiety Inventory (STAI) were reported as .543, -.224, -.653, and .431, respectively (Moein-Gharabayi et al., 2017). In the present study, the Cronbach's alpha coefficient was reported as .84.

2.2.2. Frustration Tolerance

Frustration Discomfort Scale (FDS): This scale was developed by Harrington in 2005 to assess an individual's level of frustration tolerance in achieving goals. Lower scores indicate higher frustration tolerance, and higher scores indicate lower frustration tolerance. This scale consists of 35 items and four subscales, including emotional intolerance, discomfort intolerance, achievement frustration intolerance, and injustice intolerance. The scale is scored using a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), with 1 representing "strongly disagree" and 5 representing "strongly agree." Harrington (2005) reported a Cronbach's alpha coefficient of .85, and the validity of the test was calculated using factor analysis with a result of .89 (Harrington, 2005). Nabizadeh and Liaghat (2019) reported a reliability coefficient of .84 using Cronbach's alpha and a validity coefficient of .84 using factor analysis (Nabizadeh & Liaghat, 2019). In the present study, the Cronbach's alpha coefficient was reported as .83.

2.2.3. Motivated Strategies for Learning

This questionnaire is a self-report tool developed by Pintrich et al. (1993) and consists of two sections: motivational strategies and learning strategies. In this study, the learning strategies section was used, which includes 50 items in two dimensions: cognitive-metacognitive learning strategies (rehearsal, 4 items; elaboration, 6 items; organization, 4 items; critical thinking, 5 items; and metacognitive self-regulation, 12 items) and resource management strategies (time and study environment management, 8 items; effort regulation, 4 items; peer learning, 3 items; and help-seeking, 4 items). Participants rate each item on a seven-point Likert scale from 1 (not at all true of me) to 7 (very true of me). Higher scores indicate greater use of learning strategies. Pintrich et al. (1991, 1993) reported a Cronbach's alpha coefficient of .80 for the overall

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scale, and the results of the validity evaluation indicate that there is a significant correlation between the factors and students' academic grades, demonstrating that the MSLQ is a reliable and effective tool for assessing students' learning strategies (Pintrich et al., 1993). In a study by Afsharian and Dortaj (2016), the validity of the questionnaire was confirmed using confirmatory factor analysis, with a standardized factor loading of .81, and internal consistency was calculated with a Cronbach's alpha of .82 (Afsharian & Dortaj, 2016). In the present study, the Cronbach's alpha coefficient was reported as .83.

2.2.4. Test Anxiety

The School Anxiety Questionnaire was developed by Phillips in 1978 to quantify school anxiety in students. This questionnaire contains 52 questions and has four components: fear of self-expression, test anxiety, lack of confidence, and physiological reactions. It is scored using a "yes" (scored as 1) or "no" (scored as 0) format. Phillips (1978) reported an internal consistency reliability coefficient using the Kuder-Richardson method of greater than .95 and a test-retest reliability coefficient between .50 and .67. The split-half reliability was calculated at .88 (Philips, 1978). The content validity of this questionnaire has been confirmed by experts, and due to the internal consistency of the questions, it can be concluded that the test has one of the evidences of construct validity; its convergent validity with the overall anxiety test was calculated at .94. Abolmaali et al. (2015) confirmed the validity of this test, considering the threefold evidence of face validity, concurrent criterion validity, and construct validity, and reported a reliability coefficient of .93 (Pouzideh, 2022). In the present study, the Cronbach's alpha coefficient was reported as .80.

2.3. Data analysis

For inferential data analysis, structural equation modeling (SEM) was used, and SPSS version 22 and LISREL 8.54 software were employed. The significance level for all tests was set at .05.

3. Findings and Results

In the present study, the 15-year-old female students numbered 78 (22.87%), the 16-year-old students numbered 86 (25.22%), the 17-year-old students numbered 178 (36.66%), and the 18-year-old students numbered 52 (15.25%). The educational level distribution was as follows: 127 students (37.24%) in the 10th grade, 109 students (31.96%) in the 11th grade, and 105 students (30.79%) in the 12th grade. Table 1 presents the descriptive statistics and Pearson correlations.

Table 1

Descriptive Statistics and Pearson Correlations

Variables	1	2	3	4	M	SD	Skewness	Kurtosis
1. Anxiety Thoughts	1				17.02	12.753	0.241	-1.523
2. Frustration Tolerance	-.707*	1			128.74	21.716	-0.552	-0.406
3. Learning Strategies	-.720*	.669*	1		76.19	12.795	0.002	-0.764
4. Test Anxiety	.253*	-.357*	-.474*	1	12.46	9.753	0.130	-0.695

*p<0.01

Table 2 below presents the most important model fit indices, indicating that the conceptual model used in this study is well-suited for explanation and fit.

Table 2

Structural Model Fit Indices

Fit Index	Value	Desired Value	Result
Chi-square/df	2.992	< 3.00	Adequate
RMSEA	0.068	< 0.08	Adequate
RMR	0.042	< 0.05	Adequate
GFI	0.93	> 0.90	Adequate
NFI	0.92	> 0.90	Adequate
IFI	0.90	> 0.90	Adequate
CFI	0.94	> 0.90	Adequate

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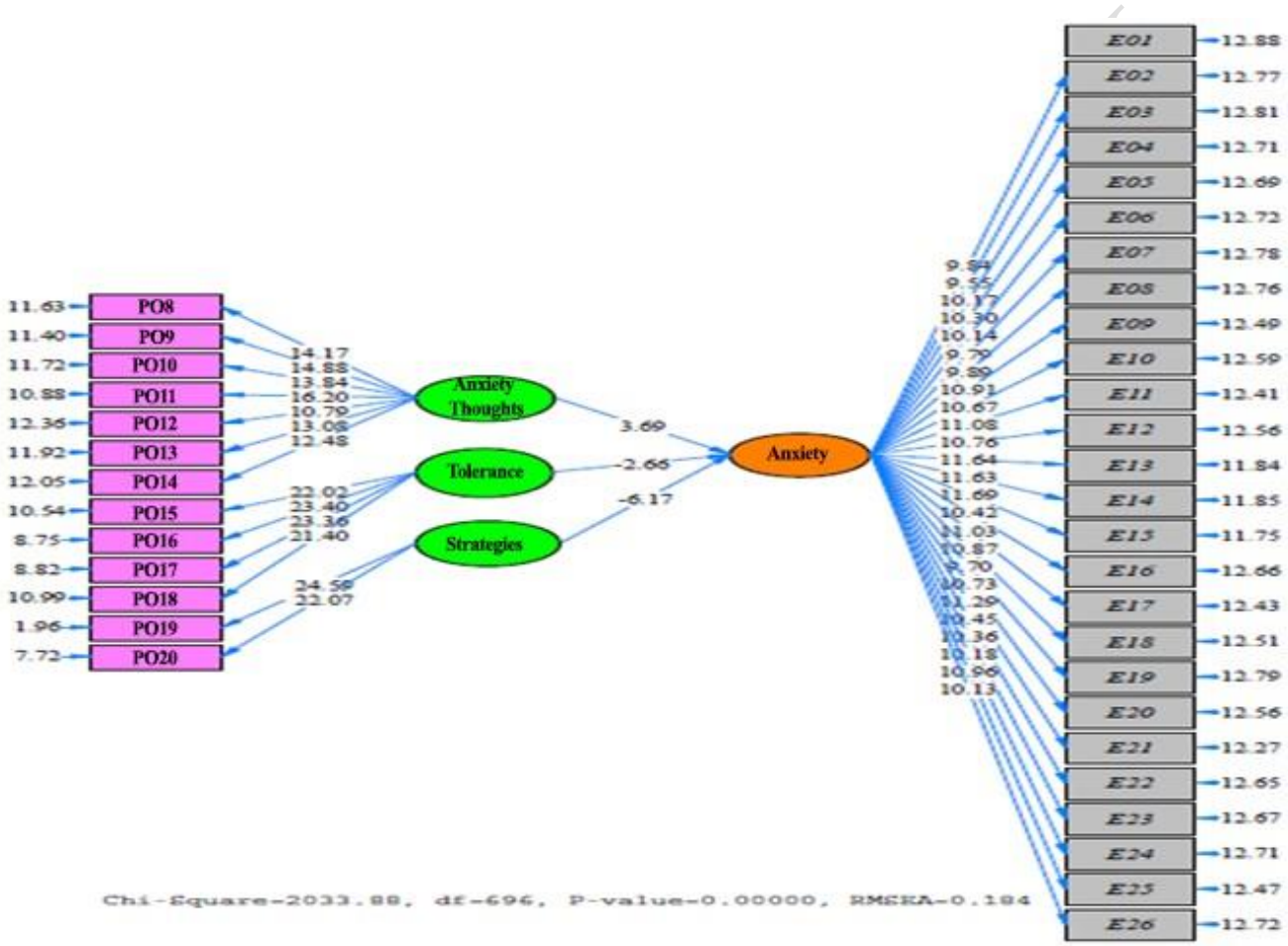
The chi-square value for our model was calculated to be 2.992, indicating a good fit. The RMSEA value for the research model was calculated to be 0.068, which indicates a good fit. The RMR value in the research model was 0.042, which is also appropriate. The model fit the data well.

Figure 1 presents the significant values of the structural model.

Figure 1

Model with Significant Values



In Table 3, the path coefficients and their significance are provided.

Table 3

Results of Structural Model Evaluation

Path	Path Coefficient (β)	t-value	Test Result
Anxiety Thoughts → Test Anxiety	0.45	3.69	Confirmed
Frustration Tolerance → Test Anxiety	-0.23	-2.66	Confirmed
Learning Strategies → Test Anxiety	-0.69	-6.17	Confirmed

According to Table 3, the significance statistic between the variable of anxiety thoughts and students' test anxiety is 3.69, which is greater than the critical value of 1.96, indicating that the relationship between anxiety thoughts and test anxiety is significant at the 95% confidence level. The path coefficient between these two variables is 0.45, indicating the positive impact of anxiety thoughts on students' test anxiety.

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The significance statistic between frustration tolerance and students' test anxiety is -2.66, which is less than the critical value of -1.96, indicating that the relationship between frustration tolerance and test anxiety is significant at the 95% confidence level. The path coefficient between these two variables is -0.23, indicating the negative impact of frustration tolerance on students' test anxiety.

The significance statistic between learning strategies and students' test anxiety is -6.17, which is less than the critical value of -1.96, indicating that the relationship between learning strategies and test anxiety is significant at the 95% confidence level. The path coefficient between these two variables is -0.69, indicating the negative impact of learning strategies on students' test anxiety.

4. Discussion and Conclusion

This study aimed to examine the impact of anxiety thoughts, frustration tolerance, and learning strategies on test anxiety among female high school students. The results showed that anxiety thoughts have a positive and direct impact on students' test anxiety. This finding is consistent with the research conducted by ... Test anxiety is a common issue among students that can have numerous negative effects on their academic performance and mental health. High test anxiety can reduce concentration and disrupt the process of information retrieval, leading to poor academic performance. Moreover, chronic anxiety can have detrimental effects on mental health. Test anxiety can lead to poor academic performance through reduced concentration, memory lapses, increased errors, and slower response times (Silaj et al., 2021). Additionally, test anxiety may cause stress and psychological pressure, leading to mental health issues in students (McLeod & Boyes, 2021; Wei et al., 2022).

One factor that affects students' test anxiety is anxiety thoughts or the ability to tolerate frustration and failure. Students with lower anxiety thoughts, meaning less ability to tolerate frustration and failure, experience more intense emotional reactions and higher anxiety when facing failure. These individuals fear failure greatly, leading them to experience significant anxiety in exams where failure is possible (Tajik et al., 2022). Therefore, based on the findings, it can be inferred that teaching frustration tolerance and failure management skills (anxiety thoughts) to students can effectively reduce their test anxiety. Teachers and counselors can assist students in coping with test anxiety by conducting workshops and educational courses in this area (Kavoi et al., 2021).

Another finding showed that frustration tolerance has a negative and direct impact on students' test anxiety. This finding aligns with prior research (Huntley et al., 2022). Frustration tolerance refers to an individual's ability to face difficult situations and setbacks without losing psychological balance (Silaj et al., 2021). Students with low frustration tolerance tend to exhibit more intense emotional reactions when facing academic challenges, especially exams. These reactions can manifest as anxiety. From the cognitive-behavioral theory perspective, individuals with low frustration tolerance usually have irrational thoughts and dysfunctional beliefs about failure and success (Taslim & Bahramipour, 2023). These thoughts can lead to a threatening evaluation of the exam situation, thereby increasing anxiety.

Furthermore, according to Bandura's self-efficacy theory (1997), individuals with low frustration tolerance usually have less belief in their abilities to face challenges. This low belief can increase anxiety in evaluative situations such as exams. From a physiological perspective, low frustration tolerance is associated with increased activation of the sympathetic nervous system (Huntley et al., 2022). This activation can exacerbate physical symptoms of anxiety, such as heart palpitations and sweating, which in turn increases test anxiety. Finally, students with low frustration tolerance tend to use less effective coping strategies (Zhang et al., 2021). These strategies, rather than reducing anxiety, can intensify it, leading to a vicious cycle. These explanations illustrate why low frustration tolerance can have a negative and direct impact on test anxiety. Understanding this connection can aid in designing effective interventions to reduce test anxiety by increasing frustration tolerance.

The final finding showed that learning strategies have a negative and direct impact on students' test anxiety. This finding is consistent with the prior research. Effective learning strategies help students better understand and retain academic material (McLeod & Boyes, 2021; Pouzideh, 2022). This leads to increased confidence and reduced test anxiety. According to Bandura's self-efficacy theory (1997), when students feel more mastery over the material, their belief in their abilities increases, and they experience less anxiety (McLeod & Boyes, 2021). The use of metacognitive strategies, such as study planning and self-assessment, helps students gain a better understanding of their learning process. Flavell (1979) believes that this metacognitive

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awareness leads to better control over the learning process. As a result, students feel more prepared for exams and experience less anxiety (Pouzideh, 2022).

Resource management strategies, such as time management and study environment management, help students prepare more effectively for exams. Pintrich and De Groot (1990) have shown that these strategies are associated with better academic performance and lower anxiety. Students who use these strategies feel more in control of their situation and, as a result, experience less anxiety (Feng et al., 2020). Collaborative and group learning strategies can increase students' sense of belonging and social support. Johnson and Johnson (1989) believe that this type of learning creates a supportive environment where students can share their concerns and learn from each other. This can help reduce test anxiety. The use of effective coping strategies, such as relaxation techniques and positive thinking, which are part of learning strategies, can directly reduce test anxiety. Lazarus and Folkman (1984) in their stress and coping theory explain how these strategies can help individuals better cope with stressful situations, such as exams. Motivational strategies, such as goal setting and self-rewarding, can increase students' motivation to study. Zimmerman (2000) has shown that these strategies are associated with better self-regulation and higher academic performance. Students with higher motivation are usually better prepared for exams and therefore experience less anxiety (Pouzideh, 2022).

In summary, this research indicates that promoting effective learning strategies can be considered an important approach to reducing students' test anxiety. These strategies, through increasing mastery over the material, improving time and resource management, enhancing social support, improving coping skills, and increasing motivation, can help reduce test anxiety.

It can be concluded that anxiety thoughts, frustration tolerance, and learning strategies play significant roles in shaping test anxiety among female students. These findings emphasize the complexity and multidimensional nature of test anxiety. Anxiety thoughts, as worry about worry, can create a vicious cycle of negative thoughts that exacerbate anxiety. Low frustration tolerance reduces students' ability to cope with stress and potential failures, leading to increased anxiety. Learning strategies, although aimed at improving academic performance, can, if used incorrectly or inefficiently, lead to increased anxiety. These results highlight the importance of a comprehensive approach to managing test anxiety. Effective intervention programs should simultaneously focus on reducing anxiety thoughts, increasing frustration tolerance, and teaching the proper use of learning strategies. Additionally, these findings underscore the need to pay special attention to psychological and cognitive factors alongside study skills in improving academic performance and reducing test anxiety among female students.

5. Limitations & Suggestions

Like other studies, this research has limitations. One of the significant limitations is the small sample size, which was limited to female students in one district of Tonekabon. For greater generalizability, a larger and more diverse sample of students from different regions is needed. It is recommended that future studies explore other factors affecting students' test anxiety, such as parenting styles, and compare test anxiety between male and female students. Additionally, it is suggested that educational workshops be held to increase frustration tolerance and teach effective coping strategies to students, as well as to provide stress and anxiety management skills in schools.

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Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

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

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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Authors' Contributions

This article is derived from the first author's doctoral dissertation. All authors equally contributed to this article.

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