Comparing the Effectiveness of Group Schema Therapy and Cognitive Bias Modification on Test Anxiety in Male Students

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Abstract

Background: Many individuals, particularly adolescents, often deal with anxiety which in turn impacts their environmental perception. The present study aimed to compare the effectiveness of group schema therapy and cognitive bias modification (CBM) on test anxiety in high school male adolescents.

Method: This was a semi-experimental study with a pre-test and post-test design, two experimental groups, and a control group. The statistical population included all male high school students of Abadan, Iran in the academic year of 2020-2023. A total number of 45 people were selected using the convenience sampling method from secondary high schools in Abadan, Iran. Forty-five students were assigned into two experimental groups and a control group (15 students in each group). The first experimental group received schema therapy (eight 90-minute sessions; one session every week) and the second experimental group received cognitive bias modification (eight 20-minute sessions; two sessions every week). The control group was considered on the waiting list. The General Self-Efficacy Scale was used for data collection. The tools used were Ahvaz Test Anxiety Inventory)ATI) and Probe Dot Task (PDT). SPSS version 25 was applied to analyze covariance.

Results: Most of the participants were mathematics (64%) and a tenth grade (62%) students. The study results showed a significant difference between Schema Therapy, CBM, and control groups in test anxiety based on the pre-test and pre-test scores (P=0.001). Also, the experimental and control groups had significant differences in reaction time and attentional bias based on the pre-test and pre-test scores (P=0.001, P=0.025, P=0.038, P=0.026). The Schema Therapy and CBM groups also showed a significant difference between pre-test and post-test observations (P=0.001). However, no difference was found in the control group based on pre-test and post-test scores (P=0.054, P=0.424, P=0.709, P=0.066).

Conclusions: Schema therapy and CBM groups showed a significant difference in test anxiety between the pre-test and post-test observations. However, no difference was found in the control group. Given the pre- and post-test scores, the CBM experimental group and the control group showed significant differences in reaction time and attentional bias However, there were no significant differences in the control group. Thus, it can be concluded that these two treatment models can be used to reduce the mentioned psychological abnormalities in students and help improve their mental health.

Keywords: Schema therapy, Cognitive bias modification (CBM), Test anxiety, Male, Student

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1. Introduction

Adolescence is a critical period of life characterized by social, emotional, and physical changes (1). Emotions and feelings strongly influence adolescent behavior (2). Adolescents face various challenges such as striving for acceptance and self-identity, building relationships with peers, establishing emotional connections, separating from parents, setting academic and career goals, developing value systems, and learning social responsibility (3). Adolescents today experience stressors their predecessors never faced due to significant changes in education, social life, and family, affecting their mental health (4). One out of every five adolescents experience mental health problems. A wide range of mental disorders develop by the age of 14, 75% of which start by the mid-20s. This suggests that mental health challenges for adolescents are more significant than what is generally believed (5). Anxiety disorders are common among adolescents, affecting up to 22% of individuals aged 15 to 19 within a year. This can lead to altered perceptions of their environment (6). Research indicated that anxiety can manifest as negative thoughts, worries, physiological arousal, negative emotions, and behavioral responses like avoidance (7). Test anxiety is a prevalent form of anxiety experienced by adolescents, characterized by evaluative concerns related to assessments

or self-threats arising from test situations (8). Excessive test anxiety can result in psychological, physiological, and behavioral reactions, with 15% to 22% of adolescent students reporting high levels of test anxiety (9). Test anxiety involves physiological and behavioral elements that individuals encounter in evaluative contexts, specifically when disruptions in cognitive and attentional processes impact performance (10, 11). Elevated levels of test anxiety can increase the likelihood of developing anxiety and depression disorders in the future (12).

When individuals are expected to perform well, they often experience test anxiety. This is especially true in educational settings where good performance is necessary to meet or exceed academic standards, leading to significant stress for students (13). Studies focusing on the developmental patterns of psychological abnormalities emphasized that disorders such as anxiety disorders increase progressively during adolescence, with some considering this period as the onset of disturbing anxious preoccupations (14). Preventive and early intervention in adolescent mental health is crucial to minimizing mental disorders. However, while interventions for prevention and treatment have shown significant achievements in early ages, early intervention in adolescent mental health remains somewhat neglected (15). This is particularly true for adolescent mental health care as traditional services have primarily focused on providing health benefits to adults during crises, leaving mental health services for young people somewhat overlooked (16). Given that a spectrum of mental disorders begins in adolescence and usually involves limited and controllable psychosocial problems in adolescence that potentially play a major role in the emergence of more serious mental disorders in later years (17), therapeutic intervention in adolescence not only improves adaptation to current conditions but also accelerates its positive impact on subsequent life stages (11). Accordingly, it appears crucial to address anxiety in adolescents and adopt appropriate preventive and therapeutic intervention approaches. Therefore, two intervention methods used collectively are employed: schema therapy and cognitive bias modification concerning threat signals. Schema therapy was designed by Yang-Yen and colleagues (18), primarily based on expanding and extending classical cognitive-behavioral therapy concepts and methods.

Some distinct features of schema therapy that distinguish it from other therapies include: Schema therapy emphasizes current symptomatology more than classical therapies like cognitive-behavioral therapy. Schema therapy emphasizes the therapeutic relationship between the therapist and the client and its potential for corrective influence compared with other therapies. Schema therapy aims to help the client understand their core emotional needs and learn ways to meet them. Schema therapy extensively focuses on processing memories and experiences of childhood trauma and uses experiential techniques (emotional) to modify negative emotions associated with such memories (19). Various studies have been conducted in different communities regarding the efficacy of these therapeutic methods. Peeters and co-workers reported that a combined treatment of schema therapy with exposure and response prevention is effective in reducing chronic anxiety in clients (20). The study by Baljé and colleagues demonstrated the effectiveness of group schema therapy in improving symptoms of social anxiety (21).

The second group therapy intervention, known as cognitive bias modification, aims to provide a cost-effective, time-saving, and easily implementable alternative to other intervention methods (22). This intervention focuses on addressing cognitive biases that affect how individuals process and interpret information, making it potentially beneficial for changing biases that contribute to persistent anxiety (23). There is substantial initial evidence supporting the efficacy of interventions that involve training and adjusting attention patterns using computer programs (24). Studies have shown that anxiety-related biases can be influenced by web-based cognitive-behavioral interventions (22, 25). Cognitive bias modification involves directly manipulating established patterns of cognitive biases through exposure and interpretation of probabilities over time (22). A study found that cognitive bias modification effectively intervenes in social anxiety, demonstrating its effectiveness in reducing anxiety symptoms (26, 27). Shafiei and Zare suggested that computer-based attention bias modification training could serve as an alternative or additional intervention for individuals with attention biases related to social anxiety (28). Saeedmanesh and colleagues revealed that a combined treatment involving attention bias modification and mindfulness can improve

executive functioning in children with pervasive anxiety disorders (26).

Therefore, the primary focus of the present study was to examine the effects of group schema therapy and cognitive bias correction on anxiety levels in high school boys experiencing test anxiety. The study also aimed to determine whether group schema therapy and cognitive bias correction can reduce anxiety levels in high school boys with test anxiety. Additionally, the study sought to identify which intervention method - group schema therapy or cognitive bias correction - has a greater impact on anxiety levels in high school boys with test anxiety.

2. Methods

This was a semi-experimental study with a pretest-posttest multi-group design. The study population consisted of high school boys experiencing test anxiety in secondary schools in Abadan, Iran during the academic year 2022-2023. A total of 45 high school boys were chosen using a cluster random sampling method from secondary schools. The sample size adequacy was confirmed using G*Power software (α=0.05, Mean±SD=54.93±9.41 and 50.87±9.15, and power test=0.90). One school was randomly selected from all schools in the city, and 45 students were divided into two experimental groups and a control group (with 15 students in each group). The first experimental group underwent schema therapy (eight 90-minute sessions; weekly sessions), while the second experimental group received cognitive bias modification (eight 20-minute sessions; two sessions per week). The control group remained on a waiting list. A total number of 130 students completed the research questionnaire, out of which 45 participants were randomly assigned into three groups: group schema therapy recipients, cognitive bias modification recipients using probe dot software, and a control group (each group comprising 15 individuals).

The inclusion criteria were: signing an informed consent to participate in the study, obtaining a score higher than 37 on the test anxiety scale, no history of psychiatric disorders or acute physical illness, and no addiction (as self-declared by the participants). The exclusion criteria were: absence from more than two treatment sessions, concurrent participation in another treatment program, a prominent mental illness, consumption of psychiatric drugs, and a chronic physical illness or organ defect.

First of all, the university prepared an introductory letter for Abadan Education which served as a request for the code of ethics, and the administrative process was conducted using the same introductory letter. Following this, the researchers from Abadan Education, along with their introduction letters, were recommended and directed to three high schools. However; only one of the schools permitted the researchers to reach out to their students. To collect data, 130 anxiety test questionnaires from Ahvaz (were distributed among grades 10 and 11 students who expressed their willingness to participate. Using a selection process, 45 individuals with scores higher than 37 were selected as the sample group. In the assignment phase, these individuals were randomly divided into three groups, each consisting of 15 people. The groups were labeled as First experiment, Second experiment, and Control. The random assignment was determined using dice. To begin with, perfectionism questionnaires, trait and state anxiety questionnaires, and aggression questionnaires were distributed among all three groups during the pre-test phase. Subsequently, the First experimental group underwent eight sessions of 90-minute group schema therapy, twice a week (Table 1). The Second group received eight sessions of cognitive bias correction using a probe dot test. Meanwhile, the Control group (waiting list) did not receive any training during this stage. Finally, a post-test was conducted for all three groups. As for sample attrition, individual CBM sessions and the presence of the first author at school ensured the timely completion of the homework by the CBM group and their participation. Consequently, there was no observed attrition within the sample. Furthermore, the students in the schema group attended all sessions except for no more than two, as outlined in the exit criteria.

2.1. Probe Dot Task (PDT): The initial version of the probe dot task, designed to assess attentional bias and modification and alteration of visual attention, was developed by MacLeod and colleagues (24). In the present study, for constructing the probe dot task, a list of anxiety-provoking words was selected from the attentional bias modification protocol for anxiety (26), and normalized among students before the anxiety-inducing sessions based on

Table 1: Training session protocol

Session	Session Topics
Session 1	1- Introduction and efforts to establish therapeutic relationships with clients 2- Explanation of the implementation method and number of sessions, clarification of the intended goals
Session 2	Training on Initial Maladaptive Schemas 1- Training and explanation of types of maladaptive schemas and their association with psychological disorders such as anxiety, aggression, and perfectionism 2- Explanation and discussion about coping styles and their role in perpetuating
Session 3	Cognitive Techniques Training 1- Explanation of the impact of schemas on cognitions and the role of cognitive techniques in modifying them 2- Training and implementation of schema validity assessment
Session 4:	Experimental Techniques Training 1- Explanation of the logic and goals of experimental techniques 2- Training on mental imagery techniques for participants
Session 5	1- Training on the logic and goals of behavioral techniques and behavioral pattern disruption 2- Training on creating a comprehensive list of behaviors leading to the creation and perpetuation of schemas and alternative behaviors 3- Providing solutions for creating a list of desired schema behaviors
Session 6	1- Review of the role of behavioral patterns in maintaining schema behaviors and efforts to increase motivation for changing desired behavioral patterns 2- Training and practice of healthy alternative behaviors through visualization
Session 7	Summary and Review 1- Summary of the content presented in previous sessions 2- Review of assignments given and addressing questions and concerns
Session 8	1- Reviewing a summary of the content presented in previous sessions 2- Testing the assignments given and responding to questions and concerns

the terminology selected by the referees. This list consisted of 80 emotionally threatening words and 80 neutral words, with each session containing 12-word pairs, each pair comprising one neutral word and one emotionally threatening word. The computerized attentional bias modification task was conducted twice weekly for four weeks, each lasting 20 minutes, totaling eight sessions. Three 14-inch laptops with the probe dot program installed were used for this task.

2.2. Attentional Bias Execution Procedure: Each participant sat 50 cm away from the monitor to perform the task. Initially, a "+" sign appeared on the monitor for 500 milliseconds to fixate the participant's attention. Then, two stimuli (words) randomly appeared on the left and right sides of the monitor, one being neutral in content and the other related to threatening cues. After 600 milliseconds, the two stimuli disappeared, and an arrow pointing up or down replaced one of the previous words. All stages, word replacements, and probe positions were randomized. However, in general, 50% of the time, the arrow replaced the neutral stimulus, and 50% of the time, it replaced the threatening stimulus. The participant had to identify the direction of the arrow correctly. When the time taken for the participant to react was quicker upon seeing an arrow replacing a word related to threat compared to a neutral word, it suggested that the participant had a focus towards threatening stimuli. The probe dot task was also used for attentional bias modification, with the arrow being replaced by the neutral stimulus 80% of the time. Over several repetitions, the individual was encouraged to consistently direct their focus towards the neutral stimulus, thereby slowly correcting their attentional bias.

2.3. Research Tools

2.3.1. Ahvaz Test Anxiety Inventory) ATI): Aboighasemi and colleagues developed a questionnaire to assess test anxiety symptoms, consisting of 25 items rated on a 4-point Likert scale from "never (0)" to "rarely (3)" (29). Scores on this questionnaire range from 0 to 75, with higher scores indicating greater levels of test anxiety. The internal consistency of the scale in the original study was 94.0 as measured by Cronbach's alpha. A subsequent Iranian study reported a reliability of 90.0 using Cronbach's alpha (30). The validity of the questionnaire was confirmed with a CVI of 0.68 and CVR of 0.72. In the present study, the internal consistency was found to be 79.0 using Cronbach's alpha, demonstrating an acceptable level of internal consistency.

2.4. Statistical Analysis

For covariance analysis, SPSS version 25 was used. Before use, the fundamental assumptions of ANCOVA were assessed. To evaluate the research hypotheses, the important assumptions were checked before implementation. The first assumption is the normality of the research variables. To determine normality, the coefficient of kurtosis and skewness of the variables were calculated. The results of this study indicated that this assumption holds for all variables in both the pre-test and post-test.

Other methods for testing normality included Kolmogorov-Smirnov and Shapiro-Wilk tests. The findings revealed that all dependent variables had a significance level above 0.05, indicating that the null hypothesis in both Kolmogorov-Smirnov and Shapiro-Wilk tests suggested that the data follows a normal distribution.

A vital requirement for conducting covariance analysis is that the dependent variables in each group are homogeneous, allowing for accurate comparisons. To evaluate the equality of variances, Levene's test was used, showing no significant variation in variances among the groups after the test, thus meeting this condition.

Based on the results, the F value for all variables exceeded 0.5 and was not statistically significant, meeting the assumption of equal regression slopes across all research variables. Another assumption involves assessing multiple collinearities by calculating correlations between covariate and independent variables. The F test should be significant at a $P<0.05$ level. The results indicated significant F values at the 0.05 level for all variables, supporting the assumption of a linear relationship between covariate and independent variables in all dependent variables."

3. Results

As mentioned, one high school was randomly selected from all the schools in Abadan, Iran. Forty-five students were assigned to two experimental groups and a control group (n=15 students in each group). The highest frequency was for mathematics and tenth-grade students. Also, the results of the chi-square test showed that the difference between the three groups is not significant in terms of educational grade and field of study (P=0.507, P=0.220).

Descriptive statistics were used to evaluate the research hypotheses, including mean and standard deviation. According to the study design, the analysis of covariance was used to analyze the main results. First, the Shapiro-Wilk test was used to check the normality of the distribution of the dependent variables of the study, because the significance level for test anxiety in the schema therapy group (SW=0.971, P=0.867), in the CBM group (SW=0.962, P=0.732) and control group (SW=0.966, P=0.798), for reaction time to neutral stimuli in schema therapy group (SW=0.953, P=0.577), in CBM group (SW=0.945, P=0.446) and control group (SW=0.940, P=0.379), for reaction time to target stimuli in schema therapy group (SW=0.959, P=0.676), in CBM group (SW=0.907, P=0.123) and in control group (SW=0.953, P=0.667) and for attentional bias in schema therapy group (SW=0.950, P=0.521), in CBM group (SW=0.965, P=0.777) and in control group (SW=0.941, P=0.393), and were greater than 0.05 (Table 2).

The results of Levene's test to check the equality of variance of the groups in terms of the dependent variables showed that the significance level for Test Anxiety (F=0.185, P=0.832), Reaction time to neutral stimuli (F=0.179, P=0.675), Reaction time to target stimuli (F=0.178, P=0.677) and Attentional bias (F=0.654, P=0.426) were greater than 0.05, so the three groups are the same in terms of the variance of the scores of these variables in the pre-test observation. The results of covariance analysis for between group comparisons as well as within group comparison are reported in Table 3.

According to the findings (Table 3), there was a notable distinction among the Schema Therapy, CBM, and Control groups in terms of test anxiety in the post-test phase, with adjustments made for the pre-test scores (P=0.001). Furthermore, it was observed that the discrepancy between pre-test and post-test observations was statistically significant in the Schema Therapy and CBM groups (P=0.001), while no significant difference was identified in the Control group (P=0.054). Additionally, the average scores for reaction time to neutral stimuli, reaction time to target stimuli, and attentional bias components in both the CBM experimental group and the Control group were statistically significant based on pre-test and post-test scores (P=0.025, P=0.038, P=0.026).

Table 2: Demographic findings according to the two experimental and control groups

Variables		Schema therapy	CBM	Control	χ2	P
Field of study	Mathematics field	11 (24.4%)	8 (0.17%)	10 (22.2%)	1.35	0.507
	Experimental field	4 (0.08%)	7 (0.15%)	5 (11.11%)		
Grade	Tenth-grade	8 (0.17%)	8 (0.17%)	12 (26.66%)	3.02	0.220
	Eleventh-grade	7 (15%)	7 (0.15%)	3 (0.06%)		

CBM: Cognitive Bias Modification

Table 3. Mean±SD of the research variables in experimental and control groups

Variables	Groups	Mean±SD		Within group P value
		Pre-test	Post-test	
Test Anxiety	Schema Experimental Group	54.93±9.41	50.87±9.15	0.001
	CBM Experimental Group	53.06±8.87	50.53±9.01	0.001
	Control Group	52.47±8.32	51.33±7.98	0.054
	Between group test P value	0.732	0.001	-
Reaction time to neutral stimuli	Schema Experimental Group	-	-	-
	CBM Experimental Group	733.66±217.99	633.40±174.25	0.031
	Control Group	708.33±188.07	704.40±172.02	0.424
	Between group test P value	0.736	0.025	-
Reaction time to target stimuli	Schema Experimental Group	-	-	-
	CBM Experimental Group	703.20±210.53	670.66±155.60	0.001
	Control Group	677.87±182.40	683.87±170.75	0.709
	Between group test P value	0.727	0.038	-
Attentional bias	Schema Experimental Group	-	-	-
	CBM Experimental Group	25.53±19.01	-26.80±16.14	0.001
	Control Group	45.93±25.11	27.20±26.89	0.066
	Between group test P value	0.061	0.026	-

CBM: Cognitive Bias Modification; SD: Standard Deviation

However, there was no significant variance between pre-test and post-test observations in the Control group (P=0.424, P=0.709, P=0.066).

4. Discussion

The present study aimed to compare the effectiveness of group schema therapy and cognitive bias modification in reducing anxiety symptoms related to test anxiety in high school boys. The primary finding of the study indicated that group schema therapy effectively reduces anxiety in high school boys with test anxiety. This finding aligned with the results of several studies by Peeters and colleagues (20), Baljé and co-workers (21), Mehrabizadeh Honarmand and colleagues (31), Mokhtarinejad and colleagues (32), Hayatipoor and colleagues (33), and Penney and Norton (34). The theoretical perspective suggests that cognitive biases play a fundamental role in vulnerability to anxiety. Two fundamental characteristics of these biases are exaggerated threat assessment and lack of self-control in confronting anxiety-inducing events. Individuals suffering from anxiety have less self-control and exhibit heightened reactions

to stimulating factors such as test conditions (35). From a cognitive theory perspective, individuals with negative cognitive schemas and core beliefs are at risk of developing anxiety disorders. When exposed to stressful situations, these negative schemas become active, affecting the individual's interpretation of events and leading to anxiety (36).

Another finding of study highlighted the effectiveness of cognitive bias modification in reducing anxiety symptoms in high school boys with test anxiety. This finding was consistent with studies by Beard (22), MacLeod and colleagues (24), Dodd and co-workers (25), Saeedmanesh and colleagues (26), and Arsanjani and co-workers (27). This suggests that cognitive bias modification, including attentional bias modification, is based on evidence showing that individuals selectively focus on threatening information, leading to increased anxiety. Thus, training individuals to modify their attentional bias indirectly teaches them to avoid excessive focus on threatening stimuli (22-27).

However, another finding indicated a significant difference in the effectiveness of group schema

therapy and cognitive bias modification in reducing anxiety symptoms in high school boys with test anxiety, with group schema therapy being more effective. This is in line with the perspective that cognitive biases, including attentional bias, contribute to pathological anxiety. Cognitive-behavioral therapy (CBT) models emphasize cognitive aspects of the conscious mind, mainly associated with the cerebral cortex. Therefore, they might face challenges in addressing attentional biases, which are subcortical components. However, evidence suggested that, as compared with cognitive techniques in psychological treatment models, web-based cognitive bias modification models can more easily target these subcortical processes (35). In conclusion, the findings collectively suggested that attentional bias in anxiety disorders involves both cortical and subcortical abnormalities. Given that cognitive-behavioral models primarily emphasize conscious cognitive aspects associated with the cerebral cortex, addressing attentional biases, a subcortical component, can be challenging. Evidence indicated web-based cognitive bias modification models can effectively target these underlying subcortical processes (22-28).

4.1. Limitation

Using the same questionnaires in both the pre-test and post-test observations may have led to the students getting familiar with the questions, which could have influenced the results because of the pre-test effect. The redistribution of the same questionnaire to students increases the chance of students making assumptions and introduces the possibility of the Rosenthal effect. The lack of resources hindered the ability to conduct follow-up tests. The present study solely relied on questionnaires to collect data, which possess limitations in accurately measuring psychological variables. It is crucial to proceed with care when generalizing the results of this study to a larger demographic, as it is centered solely on the city of Abadan, Iran.

5. Conclusions

Given the proven efficacy of psychological courses in enhancing students' psychological skills and knowledge, the education system needs to partner with universities to harness the expertise of psychology graduates to enhance mental well-being and mitigate psychological issues in students.

Authors' Contribution

Morteza Ataei: Substantial contributions to the conception and design of the work, acquisition, analysis, and interpretation of data for the work, drafting the work. Ali Pakizeh: Substantial contributions to the conception and design of the work, acquisition, analysis, and interpretation of data for the work, drafting the work and reviewing it critically for important intellectual content. Yousef Dehghani: Substantial contributions to the design of the work, drafting the work, and reviewing it critically for important intellectual content. Fariba Cheraghi: Substantial contributions to the design of the work, drafting the work, and reviewing it critically for important intellectual content. All authors have read and approved the final manuscript and agree to be accountable for all aspects of the work, such as the questions related to the accuracy or integrity of any part of the work.

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