THE EFFECTS OF COGNITIVE RESTRUCTURING AND STUDY SKILLS TRAINING ON TEST ANXIETY AND ACADEMIC ACHIEVEMENT AMONG UNIVERSITY STUDENTS

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ABSTRACT

The study investigates the effectiveness of cognitive restructuring (CR) and study-skill training (SST) on test anxiety and academic achievement among university students. The study design was an experimental design using randomized pre, post, and follow-up tests with the control group. A total of 94 participants participated in this study. They were selected randomly and assessed quantitatively three times by State-Trait Anxiety Inventory (STAI) and one time by cumulative grade point average (CGPA). The ANOVA repeated measures analysis revealed significant differences between SST and CR's effects on anxiety and academic achievement. The results indicated that students who received the-SST intervention treatment showed a substantial decrease in state and trait anxiety in the post-test and consequently improved their academic achievements. While the CR intervention treatment group significantly reduced trait anxiety in post-test and follow-up, there was no effect on state anxiety and academic achievements compared to the control group. This study underlines our contention that CR and SST psycho-educational intervention significantly affects students' test anxiety and academic achievement. Additionally, the findings suggest that SST influenced students' state and trait anxiety levels while CR just influenced students' trait anxiety. Although this study does not include qualitative research to provide a deeper understanding, the findings provide a valuable framework for psychologists, counselors, and lecturers to successfully implement psycho-educational interventions in higher education to enhance students' academic achievement and decrease anxiety levels.

Keywords: Cognitive Restructuring, Test Anxiety, Academic Achievement, Study Skills Training, Under Graduate Students

Introduction

Anxiety is a familiar emotion to all people caused by perceived danger, harm, loss, or threat (Hockenbury & Hockenbury, 2010; Arroll & Kendrick, 2018). The word anxiety comes from 'to vex or trouble'. Then anxiety means in the absence or presence of psychological stress, and anxiety can cause feelings of fear, concern, and horror (Bouras, 2007). In recent definition, anxiety refers to a physiological state that consists of emotional, somatic, cognitive, and behavioral components (Seligman et al., 2010; Kapur et al., 2019). Similarly, anxiety is assumed to be a natural and ordinary response to a stressful agent, assisting one in handling a cumbersome condition by encouraging the individual to be adapted to the problem. Severity and reason determine the normality or abnormality of anxiety (Barker, 2009; Stein & Nesse, 2015; Shin et al., 2020). In addition, anxiety is considered part of personal life in all communities as an appropriate and consistent response. Lack of anxiety or extreme anxiety can cause problems that may lead to substantial risks. On the other hand, moderate anxiety can motivate people to manage their concerns to be successful in their life (Reeve, 2014). Therefore, it is a need for students who suffer from high levels of anxiety to be taught and experience how to control it.

On the other hand, academic achievement involves how students deal with their studies in educational settings and how they handle different kinds of tasks given to them by their educators. Therefore, academic achievement is essential for students to learn written and spoken (Seif, 2013). The academic achievement evaluation measures learners' academic progress. It compares performance results with predetermined educational goals to determine whether the educators' training activities and learning efforts are achieved to a certain degree (Seif, 2013). Consequently, when the students' academic achievements are evaluated based on different examinations, it will be a tool to investigate the influential factors on their academic achievement. The evaluations include a lack of study habits and test-taking skills, cognitive distortions, and test anxiety.

Test anxiety is an educational problem that all students experience. Practically, students will experience some anxiety when taking a test, but for some students, the level of anxiety increases and ultimately affects their performance (Reiss et al., 2017; Safeer & Shah, 2019; Kumari, 2019; Ghorbani et al., 2020). Trait anxiety is also a common and valuable phenomenon in education, which involves the combination of physiological over-arousal, worry, and dread about test performance; and frequently disturbs everyday learning and decreases test performance (Miller et al., 2006; Reiss et al., 2017). Based on the DSM-5 (2013) diagnostic criteria, severe test anxiety symptoms are considered a symptom of a social anxiety disorder (American Psychiatric Association, 2013). The other evidence indicated that test anxiety is a notable phenomenon in the educational system which has a close relationship with students' performance and academic progress (Fayegh et al., 2010; Motevalli et al., 2021; Motevalli et al., 2013a,b; Abdollahi, & Abu Talib, 2015). Generally, numerous studies have shown a significant negative relationship between test anxiety and

academic achievement among anxious students (von der Embse et al., 2018; Gunderson et al., 2018; Pascoe et al., 2020).

Test anxiety is associated with severe fear, worry, high heartbeat, butterfly in the chest, and other physiological symptoms (Abdollahi & Abu Talib, 2015). Numerous studies suggest that there are at least two components of test anxiety: worry and emotionality (Putwain, 2007; Putwain & Daly, 2014; Putwain et al., 2021; ur Rehman et al., 2021). The worry component is related to the cognitive anxiety and pessimism about the student's competence and performance, but the emotionality component refers to the physiological arousal during the exams (Putwain, 2007). Anxious students interpret the exam as a threatening situation or stimulus, so in such cases, they behave as though they were in danger and threatened. The findings on test anxiety revealed that students who suffer from test anxiety had demonstrated poor academic performance (Mazzone et al., 2007; Ingul & Nordahl, 2013). Likewise, research indicated that a high-stress level could decrease the quality of students' memory, and so do their reasoning and concentration (Aronen, 2004; Dowker & Sheridan, 2022). Test anxiety suggests growing concern about situations in which there is a formal performance evaluation, specifically in the academic areas.

In test anxiety, the worry component denotes cognitive uneasy feeling about the probability of occurrence of disappointment, embarrassment, or failure. It may also involve mental disorders such as memory problems, oversensitivity, and concentration difficulty (Rothman, 2004; Wang et al., 2021). Moreover, McDonald states that the worry component refers to uncontrollable, unwanted, repelling cognitive activity linked to negative thoughts and emotional uneasiness (McDonald, 2001). The studies conducted by Lowe suggested that social humiliation and derogation are associated with fear or worry that will cause lower quality of one's performance on tests (Lowe et al., 2008).

In educational psychology, there are a considerable number of interventions to reduce anxiety levels among students and, at the same time, increase their academic achievement. One of these interventions is cognitive restructuring (CR) (Motevalli et al., 2020), which is a learning process to disprove cognitive distortions or the fundamentals of 'faulty thinking' to replace one's irrational, counter-factual beliefs with more accurate and profitable ones (Motevalli et al., 2020; Motevalli et al., 2021). However, it is remarkable to consider that CR does not entirely mention the reorganization of irrational thoughts in the brain. The ongoing restructuring of thoughts is directly related to some terms such as adaptation, accommodation, and structure of knowledge and rational thoughts. Cognitive restructuring is a psycho-therapeutic and systematic learning strategy that helps clients identify and dispute cognitive distortions. These distortions, called maladaptive thoughts, automatic negative thoughts, irrational beliefs, and emotional reasoning, are linked to various psychological disorders (Cormier, & Cormier, 1991; Gladding & Batra, 2007; Martin & Dahlen, 2005). Cognitive restructuring utilizes different kinds of strategies, such as thought recording, Socratic questioning, and guided imagery, and is applied regularly in Rational Emotive Behaviour Therapy (REBT) and Cognitive Behavioural Therapy (CBT) (Gladding, & Batra, 2007; Martin, & Dahlen, 2005).

Similarly, cognitive restructuring means different things to different people; indeed, it is a therapeutic technique that disproves irrational ideas and substitutes them with rational ones (Ogugua, 2010). There are two widely held cognitive therapeutic methods in test anxiety intervention (1) rational emotive behavior therapy (Ellis, 1962, 1977) and (2) systematic, rational restructuring (Goldfried et al., 1974). The premise is that anxiety or emotional disturbance results from illogical thoughts or beliefs. However, rational emotive behavior therapy provides the rationale for cognitive restructuring, and systematic, rational restructuring classifies this rationale into a series of more systematic steps and procedures (Zeidner, 1998; Motevalli et al., 2020).

Another therapy based on the skill-deficit model is study-skills training (SST). Some studies argue that poor study habits and test-taking abilities may cause some students to experience higher test anxiety (Gharamaleki, 2006; Spielberger & Vagg, 1995a; Motevalli et al., 2013b; Yusefzadeh et al., 2019). In addition, there are several advantages of study skills interventions to students, such as recovering and increasing the study and test-taking habits and skills to improve students' cognitive processes. These study skills affect the organization, processing, and information retrieval (Spielberger & Vagg, 1995b; Zeidner, 1998; Hailikari et al., 2018). Study skills and test-taking skills training are two related treatment components of the SST program. SST teaches students how to study and prepare for tests. This method attempts to teach students how to use study planning and time management techniques, reading and summarizing skills, monitoring study behaviors, acquiring techniques in studying for the exam and using response management techniques (Sapp, 1999; Hailikari et al., 2018). Some psychologists believe that test-taking training classifies ways that serve anxious students to comprehend exam questions better and follow the test instructions due to the appropriate information that can be retrieved, organized, and communicated (Spielberger & Vagg, 1995a). Consequently, several studies have shown that poor study skills can predict lower academic achievement (Ayesha & Khurshid, 2013; Numan & Hasan, 2017; Ogunsanya & Olayinka, 2020). It also significantly affects students' test anxiety and their academic achievement (Numan & Hasan, 2017).

Previous investigations revealed no noticeable evidence to apply a test anxiety intervention in Iran that considers SST (study habits and test-taking skills) and CR therapy (rational emotive therapy and systematic, rational restructuring). These were done through the experimental study with pre, post, and follow-up tests and comparing the effects of interventions among university students. Besides, previous studies considered only one program based on cognitive or behavioral therapy to cope with test anxiety. In addition, previous studies based on cognitive and behavioral therapy use advice for academic achievement.

Thus, the current study aims to investigate (a) confirming the importance of CR therapy and SST interventions among Iranian university students with test anxiety and (b) examining the effects of CR and SST on Iranian students' test anxiety (state anxiety and trait anxiety), (c)

testing the assumption that applying CR therapy and SST on test anxiety could be effective ways to increase the academic achievement among Iranian university students.

Methods

Ethical Approval and Informed Consent

The research team obtained the approval for the present study from the Faculty of Educational Studies at the Universiti Putra Malaysia and the Iran Ministry of Higher Education. Qazvin Islamic Azad University Research Management Center gave the researchers written informed consent and participants' informed writing permission. The researchers conducted the study in compliance with the American Psychological Association's (2010) ethical research principles with human participants.

Study Design

Based on the objectives of this study, an actual experimental design and pre and post-test with a control group were applied. The method in this category is natural experiments because subjects are randomly selected, and it strongly recommends designing educational experiments concerning the control they provide (Ary et al., 2018). Thus, this study collected data using an experimental research design with randomized subjects, pre-test, post-test, and follow-up within the control group. The researchers conducted a post-test-only control group design to study academic achievement in time after interventions that were presumed to have caused the change.

Population and Sampling

Ninety-four students -as the population sample- from Qazvin University's province were randomly selected and participated in this study. According to permission from the Iran ministry of higher education, the population of this study comes from undergraduate students of Qazvin university. Islamic Azad University and Buin-Zahra, were considered a sample among five high-ranked universities for the pilot study to calibrate the instrument and interventions. The researchers use Qazvin Islamic Azad University (QIAU) as a sample in the actual experiment data collection. Ecological validity (when the situational characteristics of the study are not representative of the population) could threaten external validity.

Table1: Threats to external validity and methods of control

	Threats	How to control
1	Selection-treatment interaction (non-representativeness)	Random assignment, administrating pre-tests for experimental and control groups, and making participation in the experiment as convenient as possible for all individuals in a population.
2	Setting-treatment interaction (artificiality)	Same treatment, treatment setting is a clinical setting. Thus, it is not a threat in this study.
3	Pretest-treatment interaction	Control group
4	Subject effects	Considering time intervals and generally acting to the participants, keeping students unaware of their location in the group.

5	Experimenter effects	Standardize all procedures in the treatment and refrain from communicating with the participants.

Since external validity involves determining whether the results of the experiment can be generalized to an entire population from which the samples were drawn in the study. The methods of subject selection and control procedures and type of design strengthen inferences that the findings are representative, but the induction remains inconclusive. To summarize, Table 1 explains the process of controlling the threats to external validity (e.g., selection-treatment interaction, setting-treatment interaction (artificiality), pre-test treatment interaction, and subject effects).

The power of analysis using G*Power 3.1.9.2 indicated that for ANOVA Repeated measures within-between interaction analysis, a sample size of 54 for each group would give 70% power. Therefore, 18 participants are in each group. The study suggests a total required sample size of 54 undergraduate university students. To avoid mortality, ninety-four participants were randomly selected to attend three groups (CR, SST, and CG). Using a Table of Random Numbers, the researcher randomly assigns each person in the population a number. Then the first number was assigned to the group with CR intervention, the second number to the group with SST intervention, and the third number to the CG. The researchers continued the process until this study's last number of needs was assigned to the CG. Through this process, samples were assigned randomly to three groups (two experimental and one control group).

Inclusion and Exclusion Criteria

There were some inclusion criteria for attending this study, such as (1) registered as full-time students at the undergraduate level, (2) currently reporting some irritating symptoms of anxiety to the university counseling office, and (3) being diagnosed with at least mild symptoms of a generalized anxiety disorder (because test anxiety can be identified as one kind of generalized anxiety disorder) by the university counselor. Moreover, there were some exclusion criteria for participating in this study, such as inability or unwillingness to attend the evaluation in post-test and follow-up and failure to follow the psycho-educational sessions for more than three sessions. Their disturbance is attributable to the physiological effects of a substance (e.g., a drug of abuse, a medication) or another medical condition (e.g., hyperthyroidism). Another mental disorder better explains their disturbance (e.g., panic disorder, social phobia, obsessive-compulsive disorder, separation anxiety disorder, posttraumatic stress disorder, or mood disorders).

Measures

State-Trait Anxiety Inventory (STAI)

The main instrument used for assessment in this study was State-Trait Anxiety Inventory (STAI), developed by Spielberger in 1970 and revised in 1980. This revised instrument of anxiety inventory is known as a self-reported measure, in two different sections and 20 items for each—the first section standards “state anxiety” in terms of the emotional component of anxiety. Similarly, the second section measures “trait anxiety” as a worry

component of test anxiety. Meanwhile, each question is scored separately 1to 4-point Likert scale (1: almost never, 2: sometimes, 3: always, and 4: almost always). All participants attempted the validated Farsi version of the STAI (Abduli, 2005) questionnaire (Bilingual; English-Farsi). The validity coefficient of state anxiety was 0.88, and for the trait anxiety was 0.86 also.

Academic Achievement

The researchers collected the Academic Achievement or Cumulative Grade Point Average data at the end of the second semester via grading the students' average marks. The collected data was in line with the Iranian educational system of CGPA, graded from 0.00 to 20.00 scale with 10.00 as the lowest passing grade. Table 2. shows the equality of the Iranian Grading Scale with the European and US grading system.

Table 2: Grading Scale in Iranian Higher Education

Iranian Scale	18.00-20.00	16.00-17.99	14.00-15.99	12.00-13.99	10.00-11.99	0.00-9.99
European & US Scale	A+	A	B	C	D	F

Interventions Treatments

Two intervention treatments (CR and SST) based on the cognitive approach and deficit skills theory apply to this study's CR and SST groups. The first experimental group was given eight sessions of the CR intervention treatment within 90 minutes for every session. Experimental group 2 also was assigned an SST treatment program with parallel sessions and duration. All of the participants undertook the treatment session consecutively once a week.

Cognitive Restructuring (CR)

Cognitive restructuring consists of eight critical activities to assist anxious students in understanding cognitive restructuring (CR). It describes how it can help them cope with irrational beliefs and ways to replace them with rational ones based on the CR Module developed by the researchers (Motevalli et al., 2020). Likewise, this intervention includes some strategies on cognitive restructuring that were helpful even if students do not suffer from high test anxiety. By completing cognitive restructuring module, anxious students are expected to: W1- understand the concept of anxiety and test anxiety, and its effects on the academic achievement (on the basis of test anxiety); W2- identify and explain two components of test anxiety (state and trait anxiety's symptoms, causes and effects); W3- determine the extreme irrational core beliefs about taking tests and study habits and identify the ABCDE model in test anxiety (on the basis of REBT model); W4- Introduce and practice four dialectic techniques to understand the rational thoughts such as recognizing, challenging, questioning, and disputing the irrational thoughts (on the basis of REBT model); W5- identify the adverse effects of perfectionism on test anxiety and academic achievement (on the basis of REBT model); W6- describe the worrisome task-irrelevant and task-relevant thoughts (on the basis of SRR model); W7- identify how to control their anxiety by

controlling task-irrelevant thoughts (on the basis of SRR), and W8- describe some different kinds of cognitive restructuring methods to cope with test anxiety and conclusion about all sessions.

Study Skills Training (SST)

SST is an intervention treatment based on the cognitive deficit approach also. Current thinking and researchers suggested that high test anxious students with poor study and test-taking skills would benefit more from SST with the interventions to improve their study habits and test-taking skills. SST improves various cognitive activities that affect the organization, processing, and retrieval of information (e.g., study habits and test-taking skills). Training in study skills does not directly address the specific cognitive components of test anxiety (Spielberger & Vagg, 1995b). Instead, it augments other cognitive interventions. By completing Study Skills Training module which was developed by the researchers (Motevalli et al., 2013) anxious students are expected to: W1- understand the concept of anxiety and test anxiety, its effects on the academic achievement, identify two components of test anxiety (state and trait anxiety); W2- determine and explain two techniques of study skills training (Study Habits and Test-Taking Skills); W3- list and explain some techniques of study skills to improve academic achievement such as motivation (essential components of motivation such as activation, persistence, and intensity, intrinsic and extrinsic motivation, learned helplessness), and goal setting (small, milestones, and big goals, SMART goals, self-performance management system); and W4- list and teach some methods of test-taking skills to improve academic achievements such as time management (activities such as time wasters self-assessment, time usage self-assessment, time-management strategies, my semester calendar, my weekly priority tasks list, and my weekly schedule) and memory [tips for sensory memory (filtering, attention, recognition, and perception), tips for short-term/working memory (highlight different approaches on short-term (Atkinson & Shiffrin, 1968) and working memory (Baddeley & Hitch, 1974), rehearsal training, duration and capacity), and tips for long-term memory such as explicit/declarative memory (conscious such as episodic and semantic) and implicit/non-declarative memory (not conscious such as procedural memory, priming, and conditioning)]; W5- defining study styles (visual, auditory, and kinaesthetic), reading efficiency (active vs. passive reader), muscle reading, MURDER (Mood, Understand, Recall, Detect, Elaborate, and Review), PQRST (Preview, Question, Read, Summarize, and Test), and PQ4R (Preview, Question, Read, Reflect, Recite, Review); W6- definition of test-taking skills, advantages and identify the tests' structure (tips for oral and written exam such as multiple choice question, fill in the blanks, matching, true/false, short essay, essay, and open book exam); W7- Some activities during the exam in order to deal effectively with oral exam (e.g. metacognitive strategies) and written exams (e.g. retrieval cues for multiple choice exams) ; W8- Conclusion of the previous sessions and question and answer about all sessions.

Measurement Procedure

The data was collected using an experimental research design with randomized subjects, pre-test, post-test, and follow-up test of the anxiety among all the groups; CR, SST, and CG. The pre-tests (STAI) were conducted before the interventions, and then the post-tests were carried out two weeks after the end of eight sessions of the intervention treatments. Finally,

the follow-up tests were conducted after six weeks of the interventions (4 weeks after post-test) to examine the effects of applied interventions after a certain period. In addition, the CG introduces all conditions and evaluations of the experiment except the experimental interventions.

Pilot Study

The pilot study has two parts: one to test the questionnaire used for the anxiety (STAI), and the other as a trial run for the participating students and senior university counselors to get acquainted with the instruction guide of interventions. Approximately 100 undergraduate students took part in the pilot study to validate the instrument used and check for the reliability of the State-Trait Anxiety Inventory (STAI). The Cronbach's alpha for the 40 items of STAI was .93, indicating that the items from a scale have good internal consistency reliability. A Pearson's correlation was computed to assess the test-retest reliability of the state anxiety scores, r (100) = .93, and trait anxiety scores, r (100) = .89. This indicates that there is also good test-retest reliability for state and trait anxiety questionnaires.

Data Analysis

The inferential data analysis was conducted using two-way repeated-measure ANOVA to identify the effects of the two treatment methods, CR and SST, on participants' anxiety (state and trait anxiety). The partial eta square (η^2) also reports the effect size of CR and SST. Bonferroni Post Hoc multiple comparisons test determines whether pre-test, post-test, and follow-up evaluation scores differed between participants in the study groups. One-way ANOVA was used to assess students' cumulative grade point average at the end of the semester. Before analysis, screening for missing values and violation of assumptions was carried out with SPSS 24.

Results

State and Trait Anxiety Pre-test Results

Pre-tests (state and trait anxiety) were conducted on all groups of students (two experimental groups and one control group). The aims of the pre-tests in this design were to assess students' state and trait anxiety for practicing students of cognitive restructuring therapy and study skills training before the treatment. One-way between-groups analysis of variance was performed to investigate state and trait anxiety differences in mean scores obtained by students taking the pre-test before the treatment. Preliminary assumption testing was conducted to check for normality and homogeneity of variance, with no serious violations noted. Table 3 and Figure 1 depict three study groups' mean scores and standard deviation in state anxiety. The one-way ANOVA test for state anxiety revealed that there was not a statistically significantly different in the mean state anxiety score among the three study groups, F (2, 91) =.15, p =.85 (Table4). Moreover, the one-way ANOVA test for trait anxiety revealed no statistically significant difference in the mean trait anxiety score among the three study groups, F (2, 91) =.037, p =.96 (Table4). Table 3 and Figure 2 depict the mean scores and standard deviation of three study groups in trait anxiety.

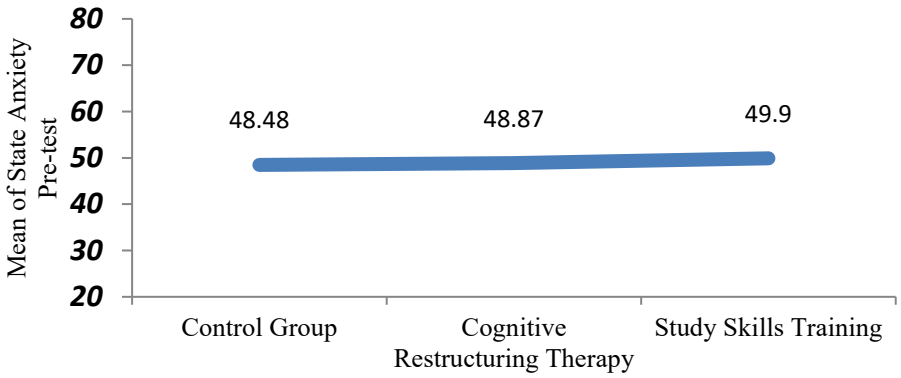

Figure1: Comparing of State Anxiety among SST, CRT, and Control Groups in a pre-test

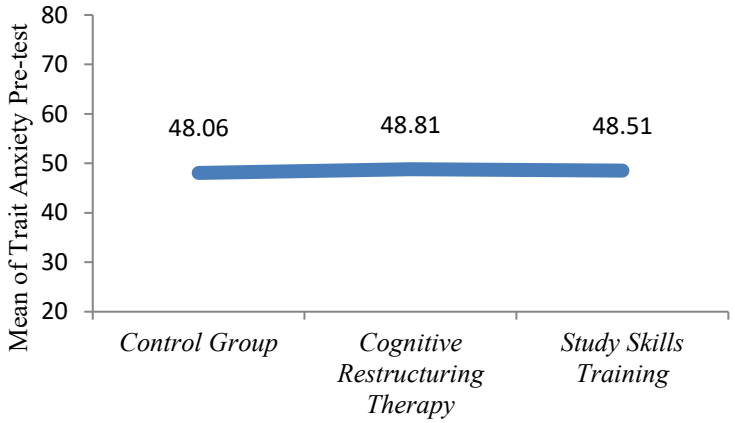

Figure2: Comparing Trait Anxiety among SST, CRT, and Control Groups in a pre-test

Table 3: Means and Standard Deviations of Study Groups on Pre-test of State and Trait Anxiety

	State Anxiety		Trait Anxiety	
Groups	M	SD	M	SD
CRT	48.88	10.04	48.81	10.93
SST	49.90	10.21	48.52	10.29
Control	48.48	10.88	48.06	11.61

Table4: One-Way ANOVA for State and Trait Anxiety pre-test

		Sum of Squares	*df*	Mean Square	F	*p*
State Anxiety	Between Groups	33.36	2	16.68	.15	.85
	Within Groups	9815.95	91	107.86		
	Total	9849.31	93			
Trait Anxiety	Between Groups	8.91	2	4.45	.03	.96
	Within Groups	10924.48	91	120.04		
	Total	10933.40	93			

Effects of CR and SST on State Anxiety

With regards to means, scores and standard deviation of students' state anxiety in pre-test are (M = 48.48, SD = 10.9) for the CG, (M = 48.88, SD = 10.05) for the CR group, and (M = 49.90, SD = 10.22) for SST group suggest that students' state anxiety among study groups is homogeneous. Similarly, with regards to means scores and standard deviation of students' state anxiety in post-test are (M = 47.84, SD = 10.62) for the CG, (M = 47.25, SD = 10.15) for CR group, and (M = 39.03, SD = 7.9) for SST group suggest that students' state anxiety on SST group is different from CR and CG. Finally, with regards to means scores and standard deviation of students' state anxiety in follow-up are (M = 48.06, SD = 10.71) for the CG, (M = 47.22, SD = 10.04) for CR group, and (M = 40.71, SD = 8.32) for SST group suggest that students' state anxiety on SST group is different from CG and CR groups (Table 5).

Table 5: State and trait anxiety of the participants based on the groups

(Mean ± SD)

Times	Groups	State Anxiety	Trait Anxiety
Pre-test	Control (n=31)	48.48± 10.88	48.06±11.61
	CR (n=32)	48.88±10.05	48.81±10.93
	SST (n=31)	49.90±10.22	48.52±10.29
Post-test	Control	47.84±10.62	47.90±11.30
	CR	47.25±10.15	39.25±9.75
	SST	39.03±7.89	41.39±7.72
Follow-up	Control	48.06±10.71	48.10±11.62
	CR	47.22±10.04	40.59±9.63
	SST	40.71±8.32	42.00±7.62

Two-way Repeated-Measures ANOVA, with Greenhouse-Geisser correction, was conducted to assess the main intervention effect, time main effect, and interaction between interventions and time. The following assumptions test, (a) independence of observations, (b) normality, and (c) sphericity. It meets the independence of observations and normality with the assumption of sphericity violated. As such, the researchers use Greenhouse-Geisser correction. Two-way Repeated Measure ANOVA is conducted to study the effect of groups across the test. Mauchly's test assumption of sphericity was not violated for state anxiety (χ^2 (2, .05) = 40.88, $p < .01$). So, the degree of freedom had to be adjusted using Greenhouse-Geisser correction ($\varepsilon = .73$). The findings for within-subjects effects of repeated measure of time were ($F(2.93, 133.33) = 56.77$, $p < 0.001$, $\eta^2 = 0.55$, $f = 1.1$). The p-value is reported as .001, which means less than .05. The average mean score for state anxiety across time (test) was significantly different among the three groups. Thus, the null hypothesis of the time effect is rejected (Table 6).

Table 6: Two-way repeated measure ANOVA analysis between time and study groups for state and trait anxiety

Source	Sum of Squares		Df		Mean		F		*p*	
	state anxiety	trait anxiety	state anxiety	trait anxiety	state anxiety	trait anxiety	state anxiety	trait anxiety	state anxiety	trait anxiety
test	1055.3	1757.08	1.46	1.31	720.28	1343.67	104.58	164.21	.001	.001
test * Group	1145.7	900.13	2.93	2.61	390.99	344.17	56.77	42.06	.001	.001
Error	918.28	973.71	133.32	118.99	6.88	8.18				

According to Figure 3, the experimental group's means scores in state anxiety (SST) faced a marked drop between pre-test and post-test. It showed that the intervention was influential in the SST group. The SST group experienced a rapid decline of mean scores in state anxiety from pre-test to post-test and a steady increase from post-test to follow-up. Regarding this figure, the CG and CR did not show any significant changes in mean scores in state anxiety across pre, post, and follow-up tests. Post-hoc pairwise comparison was conducted to determine the significant difference between the groups based on the two interventions (CR and SST) in pairs in state anxiety (Table 7).

According to Table 7, the difference in mean scores of state anxiety post-test between group 1 and group 2 (CG and CR) with a p-value reported at 1.00, there is no significant difference. Besides, the results showed the mean difference of state anxiety between group 1 and group 3 (CG and SST) in post-test with a p-value reported at the .002 and between group 2 and group 3 (CR and SST) with a p-value reported at the .003, is significant because of the p-value is smaller than .05. With regards to Table 7, the difference in mean scores of state anxiety post-test between group 1 and group 2 (CG and CR) with a p-value reported at 1.00, there is no significant difference. Besides, the results showed the mean difference of state anxiety between group 1 and group 3 (CG and SST) in post-test, with p-value reported at the .011, and also between group 2 and group 3 (CR and SST) with a p-value reported at the .029, is significant because of the p-value is smaller than .05.

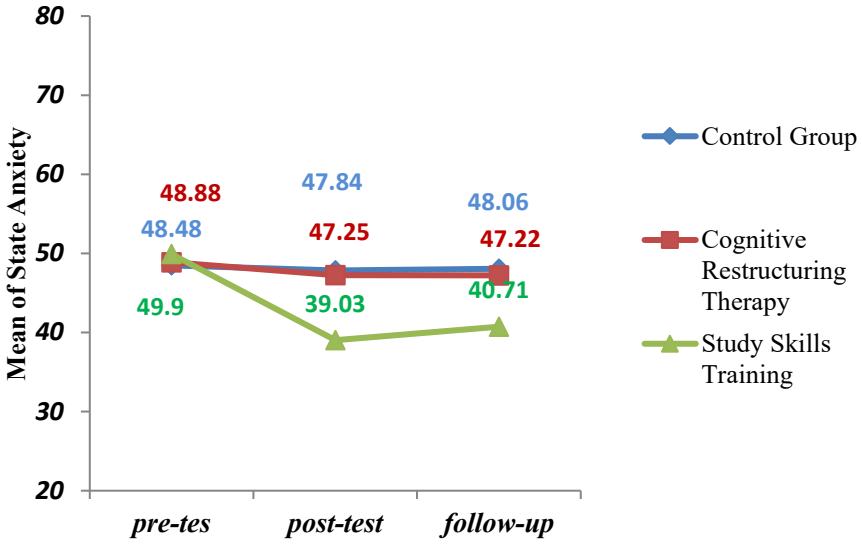

Figure 3: Mean of state anxiety obtained by study groups across pre, post, and follow-up tests

Table 7: Mean comparisons between pre, post, and follow-up tests in study groups for state and trait anxiety

Study Groups	(I) Test	(J) Test	Mean Difference (I-J)		Std. Error		Sig	
			state anxiety	trait anxiety	state anxiety	trait anxiety	state anxiety	trait anxiety
CG	1	2	.645	.16	.63	.68	.93	1.00
	1	3	.42	-.03	.67	.69	1.00	1.00
	2	3	-.226	-.19	.36	.3	1.00	1.00
CR	1	2	1.62	9.56	.62	.67	.03	.001
	1	3	1.66	8.22	.66	.68	.04	.001
	2	3	.031	-1.34	.36	.3	1.00	.001
SST	1	2	10.87	7.13	.63	.68	.001	.001
	1	3	9.19	6.52	.67	.7	.001	.001
	2	3	-1.68	-.613	.36	.31	.001	.15

Table 7 presented the three different pairs for the difference between mean scores of state anxiety between pre-test and post-test, pre-test and follow-up, and post-test and follow-up for all study groups. Regarding the table, the difference is significant for the two pairs in the first experimental group that received CR intervention. It is because the mean state anxiety scores between pre-test and post-test with p-value= .03 are smaller than .05. Furthermore, the difference in mean state anxiety scores between pre-test and follow-up with p-value= .04 is smaller than .05. However, there is no significant difference between post-test and follow-up in state anxiety in the first experimental group, which received CR because the mean scores of state anxiety between post-test and follow-up with p-value= 1.00 are bigger than .05. Correspondingly, the difference between the pre-test and post-test, pre-test and follow-up, and post-test and follow-up in state anxiety is significant for the second experimental

group that received SST intervention. It is because of the significant level reported at 1.00, which means it is smaller than .05. As it mentioned earlier, Cohen (1988); (Cohen, 1992) reported criteria for η^2 as follows (.01 = small effect, .06 = moderate effect, and .14 = large effect). The effect size for the mean comparison of state anxiety among three groups in the pre-test was .003. However, it was .15 and .11 in post-test and follow-up, which showed a high level of differences among the three groups.

Effects of CR and SST on Trait Anxiety

With regards to means scores and standard deviation of students' trait anxiety in pre-test are (M = 48.06, SD= 11.61) for the CG, (M = 48.81, SD = 10.93) for the CR group, and (Mean = 48.52, SD = 10.29) for SST group suggest that students' trait anxiety among study groups is homogeneous. The means scores and standard deviation of students' trait anxiety in post-test are (M = 47.90, SD = 11.30) for the CG, (M = 39.25, SD = 9.75) for the CR group, and (M = 41.39, SD= 7.72) for SST group suggest that students' trait anxiety on SST and CR groups are different from the CG. The means scores and standard deviation of students' trait anxiety in follow-up are (M = 48.10, SD = 11.62) for the CG, (M = 40.59, SD = 9.63) for the CR group, and (M = 42.00, SD = 7.62) for SST group suggest that students' trait anxiety on SST and CR groups are different from the CG (Table 2).

Two-way Repeated-Measures ANOVA, with Greenhouse-Geisser correction, was conducted to assess whether there were differences between the mean of trait anxiety of pre-test, post-test, and follow-up among the students in CR, SST, and CG. The following assumptions test (a) independence of observations, (b) normality, and (c) sphericity, meeting the independence of observations and normality with the assumption of sphericity violated. Thus, the Greenhouse-Geisser correction was used. Mauchly's test assumption of sphericity was not violated for trait anxiety (χ^2 (2, .05) = 67.84, $p < .01$). So, the degree of freedom had to be adjusted using Greenhouse-Geisser correction (ε= .65). The findings for within-subjects effects of Repeated Measure of time were (F (2.62, 118.99) = 42.06, $p < 0.001$, η^2 = 0.48, f =.96). The p-value is reported as .001, which means less than .05. The average mean score for trait anxiety across time (test) was significantly different among the three groups. Thus, the null hypothesis is rejected (Table 7).

Figure 4 shows the means scores in trait anxiety of two experimental groups (CR and SST) facing a marked drop between pre-test and post-test. It showed that the treatments were effective in two experimental groups. Both experimental groups that received CR and SST experienced a rapid decline in mean scores in trait anxiety from pre-test to post-test and a steady decrease from post-test to follow-up. The mean scores of trait anxiety in these two groups were at the same level from post-test to follow-up and stood in the same situation. Regarding this figure, the CG did not show any significant changes in mean scores in trait anxiety across pre, post, and follow-up tests. Bonferroni Post-hoc pairwise comparison was conducted to determine the significant difference between the groups based on the two interventions (CR and SST) in pairs.

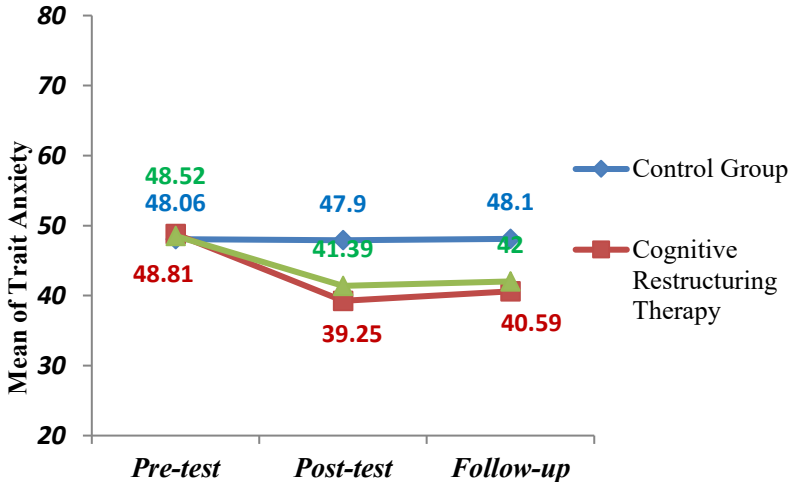

Figure 4: Mean of trait anxiety obtained by study groups across pre, post, and follow-up tests

Table 8 illustrates that the mean difference in trait anxiety between groups (CG, CR, and SST) in pairs was **in**significant in the pre-test. For instance, the difference in means of trait anxiety between group 1 and group 2 (CG-CR) was not statistically significant. It is because the *p-value* reported at 1.00, which is bigger than .05. Furthermore, the table showed the mean difference between groups in post-test and follow-up is significant in pairs. According to Table 3, the difference in mean scores of trait anxiety post-test between group 1 and group 2 (CG and CR) with *p-value* reported at the.002, and also between group 1 and group 3 (CG and SST) with *p-value* reported at the .02, there are significant differences. The results showed that the mean difference in the mean of trait anxiety between group 2 and group 3 (CR and SST) in post-test is insignificant because of the *p-value* = 1.00. Based on the difference in the mean scores of trait anxiety follow-up between group 1 and group 2 (CG and CR) with a value reported at the.01, and between group 1 and group 3 (CG and SST) with a *p-value* reported at the .047, there are significant differences. The results also showed that the mean difference in trait anxiety between group 2 and group 3 (CR and SST) in follow-up is insignificant because of the *p-value* = 1.00. As it mentioned earlier, Cohen (1988); (Cohen, 1992) reported criteria for η^2 as follows (.01 = small effect, .06 = moderate effect, and .14 = large effect). The effect size for the mean comparison of trait anxiety among three groups in the pre-test was .001. However, it was .13 and .11 in post-test and follow-up, which showed a high level of differences among the three groups. Effects of CR and SST on Academic Achievement

Table 8: Mean comparison between study groups in pre, post, and follow-up tests for state and trait anxiety (Pairwise comparison)

STAI	(I) Study Groups	(J) Study Groups	Mean Difference (I-J)		Std. Error		Sig	
			state anxiety	trait anxiety	state anxiety	trait anxiety	state anxiety	trait anxiety
Pre-test	CG	CR	-.39	-.75	2.6	2.76	1.00	1.00
	CG	SST	-1.42	-.45	2.64	2.78	1.00	1.00
	CR	SST	-1.03	.29	2.62	2.76	1.00	1.00
Post-test	CG	CR	.59	8.65	2.43	2.44	1.00	.002
	CG	SST	8.8	6.51	2.45	2.46	.002	.03
	CR	SST	8.22	-2.14	2.43	2.45	.003	1.00
Follow-up	CG	CR	.85	7.5	2.46	2.46	1.00	.01
	CG	SST	7.35	6.1	2.48	2.48	.011	.047
	CR	SST	6.5	-1.4	2.46	2.46	.029	1.00

This study's third main null hypothesis refers to no significant difference in the mean of second-semester cumulative grade point average (CGPA) among the CR, SST, and CG students. One-way ANOVA assesses whether significant differences exist between the mean cumulative grade point average in students' second semester among the CR, SST, and CG (Figure 5). The ANOVA test revealed a statistically significant difference in the mean CGPA score among the three study groups with F (2, 91) =6.09, p =.003. Based on Cohen's (1988) criteria for effect size "η^2", the eta-squared (η^2) obtained was 0.118, indicating that the mean difference among groups was large (Table 8). Bonferroni Post Hoc multiple comparisons test indicated that the SST group obtained a significantly higher mean CGPA score (M = 17.20, SD =.89) than the CG (M = 16.56, SD =.76). SST students' group also obtained a significantly higher mean of CGPA score (M = 17.20, SD =.89) than CR group (M = 16.62, SD = .74). On the other hand, there was no significant different mean score for the CG (M = 16.56, SD =.76) and CR group (M = 16.62, SD = .74) (Table 9).

Table 9: Results of analysis of variance between study groups on grade point average

Variable	N	M	SD	F	P	η^2
CR	32	16.62	.74	6.09	.003	.118
SST	31	17.20	.89			
CG	31	16.56	.76			

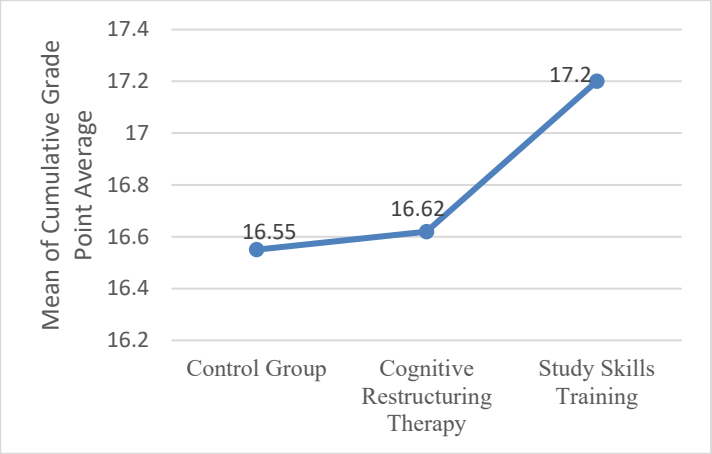

Figure 5: Comparing cumulative grade point average among study groups

Discussion

The study aimed to examine the effects of CR and SST intervention treatments on students' state, trait anxiety, and academic achievement. The findings revealed that SST could significantly reduce state and trait anxiety levels and academic achievement among university students, while CR only improved their trait anxiety level.

These findings also are in line with the results of previous research on the effects of study skills training on students' test anxiety (Gharamaleki, 2006; Sapp, 1999; Spielberger & Vagg, 1995a; Ayesha, & Khurshid, 2013; Numan, & Hasan, 2017; Ogunsanya, & Olayinka, 2020). One of the possible causes of the effectiveness of study skills training on students' state anxiety could be related to the students' coping skills. Coping skills refers to how a person attempts to change circumstances or interpretations of occasions to make them more favorable and less threatening (Folkman & Lazarus, 1991; Lazarus, 1999; Lazarus, 2000). Lazarus and Folkman (1984) classified two basic types of coping strategies: problem-focused and emotion-focused. Problem-focused coping aims to manage or change a threatening or harmful stressor by modifying the aspects of the situations that are changeable (Satterfield, 2008) or the cause of the problem (Adomako-Saahene, 2019). Problem-focused coping includes looking for more information concerning the situation, gaining new skills and strategies to manage it directly, or evaluating the negatives and positives of alternative solutions (Adomako-Saahene, 2019). Time management is one of the strategies in problem-focused coping for decreasing stress that can assist anxious people in appropriately managing stressful events. Studying skills training is highly focused on these skills as an essential skills for students. According to Robinson and Godbey (2005), time management can enhance productivity and, at the same time, reduce stress. Moreover, VanKim and Nelson (2013) found that students who met vigorous physical activity guidelines based on problem-focused coping strategies stated a lower level of perceived stress.

This coping strategy tends to be most effective when a person can exercise some control over the stressful condition or circumstances (Park et al., 2004). Emotion-focused coping strategies will be applied when a person thinks that nothing can be done to alter a situation

regarding the efforts toward relieving or regulating the emotional impact of the stressful situation. However, when coping is effective, people can adapt to the condition due to decrease stress and anxiety. According to some studies, people who applied effective coping strategies such as problem-focused and positive emotion-focused coping strategies experienced a low level of stress and anxiety exactly after the stressful event or even after a long time (Hanton et al., 2008; Szabo et al., 2016; Akhtar et al., 2019). In the current study, instead of directly decreasing the level of students' state anxiety, study skills training intervention attempts to cope with pressure based on problem-focused coping strategies by training students to improve their study habits and test-taking skills. Therefore, when anxious students improved their study and test-taking skills as a problem-focused approach, they could cope with state anxiety more than students who attended CR and CG.

The study's second objective was to determine the effects of CR and SST interventions on students' test anxiety (trait anxiety component). The finding related to this objective indicated that when students are involved in cognitive restructuring, their level of trait anxiety decreases significantly. Similarly, the results also proved that when students are engaged in SST intervention, their levels of trait anxiety decrease significantly among students. In addition, students' trait anxiety reduces significantly by conducting cognitive restructuring (the combination of Rational Emotive Behavior Therapy and Systematic Rational Restructuring) and SST (the combination of study habits and test-taking skills) interventions. Furthermore, the finding is consistent with the previous studies on the effects of cognitive therapy (Gharamaleki, 2006; Sansgiry et al., 2006; Sapp, 1999; Spielberger & Vagg, 1995b; Reiss et al., 2017; Podina et al., 2020) and study skills training (Gharamaleki, 2006; Sapp, 1999; Spielberger & Vagg, 1995a; Ayesha, & Khurshid, 2013; Numan, & Hasan, 2017; Ogunsanya, & Olayinka, 2020) on students' test anxiety.

Based on CR intervention, students are trained to challenge, recognize, and change irrational belief systems. This intervention applies rational emotive behavior therapy and then discovers the worrisome task-irrelevant thoughts and substitutes positive self-statement that redirects the attention to the task-relevant views using systematic, sound restructuring therapy. Anxious students could cope adequately with the trait anxiety component. However, SST intervention attempts to guide anxious students to adopt scientific study habits such as learning style, memory functions, time management, goal setting, motivation, reading, and summarizing skills instead of using the traditional study habit. Similarly, the current SST focuses on educating anxious students to apply some test-taking skills before, during, and after the exam to improve their academic achievement and challenge to decrease the level of students' trait anxiety. Based on the problem-focusing coping strategy, SST focus on managing or changing threatening or harmful stressors (e.g., Examination) by applying some activities to control the stressful condition or circumstances (Park et al., 2004; Robinson & Godbey, 2005; VanKim, & Nelson, 2013; Adomako-Saahene, 2019). In addition, this study proved the effectiveness of new cognitive restructuring and SST interventions due to reducing the level of students' trait anxiety.

The third objective of the study was to determine the effects of CR and SST interventions on students' academic achievement. The findings related to this objective indicated that when students are involved in SST, their levels of theoretical achievement increase significantly. As a result, the authors suggested that students' academic achievement in the SST group is different from CG and CR groups. Therefore, it concludes that SST significantly affects students' academic achievement. However, the finding further revealed that when students are involved in CR, their level of academic achievement does not increase substantially. Concerning this, students' academic achievement on CR and CG was not significantly different from each other. Thus, it also concludes that CR did not significantly affect students' academic achievement. These findings also are consistent with the results of previous studies, which show the effects of SST on students' academic achievement (Gharamaleki, 2006; Sapp, 1999; Spielberger & Vagg, 1995a, 1995b; Cottrell, 2019; Matcha et al., 2019; Shilling et al., 2020).

The stressful factors of an assessment situation are critical proximal parameters that evoke high levels of test anxiety. On the other hand, academic achievement is invariably affected by pressure when attention is diverted from task to self-belittling thoughts or negative self-statements. When the test interferes cognitively with recalling the previously learned material, the student's performance is affected, leading to aggravated physiological reactivity. Some studies indicated that students with high test anxiety are concerned and encounter more distractive cognitions under assessment conditions than other students, and anxious students also deteriorate their performance (Kurosawa, & Harackiewicz, 2006; Cochran, 2019). Thus, CR may assist anxious students in removing disruptive thoughts and help students with test anxiety better control their thoughts and concentrate on the task (Reiss et al., 2017; Zeidner, 1998). Although some researchers proved the effects of cognitive therapy on test anxiety and academic achievement (no citation) but based on this study, CR could not help anxious students to cope efficiently with test anxiety and improve their academic achievement.

On the other hand, based on the skills-deficit model, meta-cognitive awareness is a distinctive characteristic of the anxiety experience. It is the case where anxious people experience more anxiety because they have negative beliefs about emotional experiences and are not ready to confront a stressful event (Leahy et al., 2019). Therefore, they will experience more emotional disturbances such as anxiety and stress and also feelings of low academic ability. Etiologically, the deficit model says that fear and poor performance result from weak efficiency on the part of the student to study well and his lack of knowledge of test-taking skills. This model traces back to the insufficient attention given by parents and the university's improper teaching strategies and styles in this regard. Considering the proximal factors which bring about evaluative stress, the skills-deficit model emphasizes the impact of the importance of the study material. This model boasts the examinee's knowledge of insufficient material intake due to poor study skills. Test anxiety indicates that the students are not ready for the test. Hence, this model aims to provide study skill training and counseling to the students to prepare to deal with the test situation (Zeidner, 1998). Concerning the findings which show significant effects of SST psycho-educational

intervention, it could be concluded that SST could help anxious students to improve their poor study habits and test-taking skills. As a result, based on adequate SST (study habits and test-taking skills) intervention, anxious students could be able to combat test anxiety and improve their academic achievement.

Conclusion

The findings of this study revealed that SST intervention treatment has significant effects on decreasing state and trait anxiety, and it could improve students' academic achievement. Therefore, SST intervention could reduce anxiety components, states, and traits, which will enhance university students' academic achievement. Meanwhile, CR intervention treatment could only diminish the feature of anxiety, and there was no significant betterment in students' academic achievement and state anxiety. This study's findings recommended that SST intervention could be a reliable treatment to assist anxious students in correctly combating test anxiety. It seems that the educational system should consider the benefit of SST methods besides the other pedagogical approaches to improve academic achievements among the students.

The implication of the study

The current study's findings have some important practical implications for those who plan to cope with test anxiety among university students by using special programs such as SST and CR for this widespread educational problem. The first practical implication of the findings is to decrease the test anxiety level in a particular psycho-educational intervention program among anxious students. It is essential to provide successful experiences with SST techniques to provide successful activities to decrease the students' test anxiety and increase their academic achievement. There are some requirement criteria to be met. The first criterion for planning any psycho-educational intervention program on test anxiety is providing a set of tasks that attempt to train anxious students to improve their study and test-taking skills. It includes the evaluation of students' motivational level with regards to intrinsic and extrinsic motivation, tasks on goal setting, time management, memory (short-term sensory store, working memory, and long-term memory), learning styles, active reading versus passive reading, muscle reading, PQ4R, and different kinds of strategies for test-taking. It reveals that activities such as study habits found in some educational training centers for anxious students in Iran do not provide appropriate treatment for the worried students to cope with test anxiety and improve their academic achievement. Thus, it is essential to consider this vital criterion in planning any psycho-educational intervention program for anxious students to enhance their academic achievement and decrease their level of test anxiety. A suitable psycho-educational intervention regarding individual differences based on students' deficit skills could provide different activities for different students. Thus, to give a sufficient intervention for anxious students, it is essential to offer a flexible training skill intervention base on the skill level of each student during an individualized intervention program. Thus, to provide a sufficient intervention for anxious students, it is vital to offer an entire CR intervention with regards to different models and techniques on a cognitive

approach to help anxious students to combat sufficiently with this common educational problem.

Limitation of the Study

This study has some potential limitations. The first limitation was selecting the sample, which presents an actual example of Iranian university students from a vast population of Iranian university students. The second limitation was applying two methods of intervention (cognitive restructuring therapy and study skills training) in this study which needed to know about the contents of treatments and engage with some problems by different subjects in different groups. Therefore, the generalization of this study to other university students in other settings such as private and public universities or even other countries must be cautious. However, the findings might be helpful for universities that are similar to the one in this study.

Recommendations

However, since its implementation at the classroom level needs some specific skills from the educators and counselors, in-service be given to educators and counselors from time to time. It recommends the Ministry of Higher Education offer an in-service course to all the lecturers and university counselors to equip themselves with pedagogical skills, especially in teaching SST and CR. Counselors and lecturers should realize that teaching SST and CR are helpful methods to decrease test anxiety and increase academic achievement among students. Even though lecturers are exposed to several pedagogical approaches, a particular emphasis on the teaching methods and techniques of study skills and test-taking should be given since its effectiveness supersedes the traditional study habits and practices.

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Compliance with Ethical Standards

Conflict of interest The authors declare that there is no conflict of interest.

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