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Abstract

Background: This study examined the effects of the leisure activity of coloring on the anxiety levels of graduate level occupational therapy students after taking a high stress exam. This study also examined the effects of the leisure activity of coloring on the students' perceptions of preparedness for and performance on the exam.

Method: The participants were recruited for this quantitative, pre/posttest study through a purposive convenience sample and randomly assigned to either the leisure activity or the control. A self-report assessment was used for data collection. The changes in anxiety levels were examined using a repeated measures analysis of variance (ANOVA). Independent sample *t*-tests were performed to compare means of the change in anxiety levels, the participants' perceptions of outcomes on the previous tests, and their perceptions of preparedness for the tests.

Results: The participants who participated in the leisure activity of coloring demonstrated a significantly greater reduction in anxiety levels than the participants in the control. Perceptions of performance on and preparedness for the previous tests did not differ between the groups.

Conclusion: The findings support using the leisure activity of coloring as an effective tool for the reduction of post-test anxiety in graduate level occupational therapy students.

Comments

The authors report they have no conflicts of interest to disclose.

Keywords

post-test anxiety, education, leisure, occupational adaptation

Cover Page Footnote

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Credentials Display

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According to the findings of an American College Health Association assessment, graduate students identified stress (20.4%) and anxiety (15.8%) as significant factors contributing to poor academic performance (ACHA, 2016). The assessment also reported that the percentage of graduate students diagnosed with anxiety increased from 14.3% in 2014 to 16.6% in 2016 (ACHA, 2014; ACHA, 2016). Because of the prevalence of graduate students with anxiety, many academic programs are concerned about how to incorporate programming aimed at reducing stress and anxiety as well as how to offer strategies designed to help students adapt to high stressful environments (Drake, Searight, & Olson-Pupek, 2014; Grasgreen, 2011; Novotney, 2014; Rose, Godfrey, & Rose, 2015).

In addition, students continue to struggle to adapt to the pressures of the college environment, as the demands of college increase (Duica et al., 2012; Novotney, 2014). For students pursuing a graduate degree in a health related field, stress can result in various negative coping strategies that lead to greater amounts of anxiety and that interfere with learning and school participation (Duica et al., 2012; Rose et al., 2015). There is a demand for both effective, nonpharmacological methods of coping with anxiety among graduate school students and supportive research that examines the effects of those coping strategies on anxiety levels (Falsafi, 2016). The profession of occupational therapy has often examined the use of leisure activity in treating mental health illnesses, such as anxiety, but little research has been done to investigate the effects of leisure activity on graduate student anxiety levels from the occupational therapist perspective (Aquadro, Cunningham, Kang, & Slaughter-Ellis, 2010; Suto, 1998).

The Effects of Stress on Learning and School Participation

Persson and Zakrisson (2015) define stress as the human physiological response to environmental demands that exceed a person's natural regulatory capacities. Prolonged exposure to stress has a negative effect on a student's physical resilience, sleep, quality of education, and quality of life, which can lead to burnout, higher attrition rates, and stress-related diseases (Drake et al., 2014; Misra & McKean, 2000; Persson & Zakrisson, 2015; Rose et al., 2015). The effect that stress has on learning and memory is also well-documented. Studies show that high stress can inhibit encoding and retrieval of information as well as the performance of newly learned skills (Flinn et al., 2016; Schwabe, Joels, Roozendall, Wolf, & Oitzl, 2012). In a study by Flinn et al. (2016) medical students were exposed to a high stress environment while participating in a surgical simulation. The students subjected to the stressful environment had greater physiological responses than the students who performed in the supportive environment. Furthermore, the students exposed to the high stress environment performed worse on the simulation, showing slower reaction times and a greater number of errors during the procedures (Flinn et al., 2016).

Post-test anxiety is the subjective feeling of tension, excitability, irritability, or restlessness that a student experiences after taking a test (Duica et al., 2012). Universities often provide workshops on managing anxiety to help students learn to prepare better for test taking and to lower the stress related to pre-test anxiety (Misra & McKean, 2000; Novotney, 2014). However, few strategies are implemented at the graduate school level to combat post-test anxiety. Given that students have little control over their college environment, it is important for students to develop positive ways to adapt to stress in order to support successful learning and school participation (Duica et al., 2012; Misra & McKean, 2000).

Stress and the Occupational Adaptation Model

From the perspective of the Occupational Adaptation (OA) model, the college environment creates a demand for mastery, and the student has the desire to master the college environment. The desire to master the college environment creates the press for mastery, or the occupational challenge,

which requires the student to adapt to the environmental demands of college (Schkade & Schultz, 1992). Maladaptive responses resulting in stress are often used when the environmental demands exceed the adaptive capacity of the student (Persson & Zakrisson, 2015; Schkade & Schultz, 1992). Occupational therapists use occupations, or activities characterized by active participation and meaning, to help people adapt to the press for mastery, and thereby reduce the resultant stress and anxiety (Schkade & Schultz, 1992). The OA model's focus on adaptation, rather than improving functional skills, provides a foundation for students to learn to adapt to the demands of college. For students in graduate school, learning to limit the anxiety they experience daily using positive adaptive strategies can help them develop the skills needed to obtain mastery in any situation, including residencies, fieldwork rotations, and new employment opportunities.

Furthermore, the OA model conceptualizes that the energy a person uses to process and adapt to his or her environment, known as adaptation energy, operates on two levels: a primary level and a secondary level (Schkade & Schultz, 1992). The primary level is a higher awareness level and drains energy quickly, while the secondary level is a more creative, subconscious level requiring much less energy to promote an adaptive response (Schkade & Schultz, 1992). On completion of a test or exam, students often ruminate on post-test anxiety at the primary level while attempting to determine ways to adapt and reduce the post-test anxiety. For many students, attempts at anxiety reduction involve the cathartic process of venting to peers or classmates about the previous test in an attempt to decrease the feelings of anxiousness. However, research does not support cathartic measures as a means of anxiety reduction (Bushman, 2002). Cathartic venting often keeps post-test anxiety at the primary level, resulting in a continuation of worry about the test outcome, and thereby quickly draining the student's overall energy. The use of creative, leisure activity requires the student to use the primary level to focus on the leisure task and move the post-test ruminations into the secondary level where the stressful thoughts can be processed efficiently (Curry & Kasser, 2005; Schkade & Schultz, 1992). Studies have shown that this mindful state reduces anxiety levels, offering an easy and effective way to lower the amount of anxiety that college students face (Curry & Kasser, 2005; Drake et al., 2014; Solan, 2015; van der Venet & Serice, 2012).

The Leisure Activity of Coloring for Reducing Stress

The implementation of meaningful leisure activities requiring focus is shown in studies to reduce anxiety, improve adaptive coping skills, manage stress, and reduce boredom that can promote rumination (Aquadro et al., 2010; Suto, 1998). We chose to examine the effects of the leisure activity of coloring as a means of post-test anxiety reduction because coloring is an affordable and easily accessible leisure activity for most people. Furthermore, engagement in the leisure activity of coloring demands little cognitive investment because it requires almost no learning curve for college level students. Evidence shows that activities requiring greater cognitive investment can increase stress during the learning process (Kool & Botvinick, 2014).

In addition, there is a resurgence in leisure participation, including coloring activities for adults. A study by Curry and Kasser (2005) looked at the effects of a 20-min activity of coloring on anxiety levels in undergraduate students after priming anxiety through episodic recall. The results showed that the mandala and an intricate plaid design were both beneficial in reducing anxiety in college students; however, a free-form coloring activity on blank paper showed no effect (Curry & Kasser, 2005). The intricate designs required the students to use their primary energy to focus on the task and relegate the

stress they experienced to secondary energy, while the free-form coloring activity on blank paper appeared to have no effect on anxiety levels (Curry & Kasser, 2005; Schkade & Schultz, 1992). The mandala and the intricate plaid design both provided structure, which induced a meditative state, while the participants who completed the blank page were expected to choose how to use the 20 min. The added ambiguity of the task could create an anxiety-inducing state instead of reducing anxiety in these participants (Curry & Kasser, 2005). In 2012, van der Venet and Serice conducted a replication study of Curry and Kasser's work that supported the effects of coloring a more intricate design versus coloring a free-form design on a blank page. However, unlike the study by Curry and Kasser, the van der Venet and Serice study found a much greater reduction in anxiety levels between the mandala and plaid designs, further supporting the use of more intricate designs in reducing anxiety levels in college students (van der Venet & Serice, 2012). A more recent replication of Curry and Kasser's study by Drake, Seabright, and Olson-Pupek (2014) also supported the use of coloring as a nonpharmacological means of reducing anxiety levels in college students. However, the results of this study showed a significant reduction in anxiety levels for all three intervention groups, including simple and free-form designs (Drake et al., 2014). Drake et al.'s study provides support for the occupational therapy concept of autonomy when determining which coloring designs might provide a motivational component to the leisure activity of coloring.

The leisure activity of coloring may be beneficial in reducing post-test anxiety in graduate students by requiring the students to focus on the coloring activity immediately after the test, thus limiting ruminative behaviors. The new adaptive response of coloring could remove the desire to participate in cathartic venting with peers or classmates and decrease the amount of anxiety that students experience in college. Aside from the Curry and Kasser (2005) study, and the two replication studies, no other studies empirically examine the effects of the leisure activity of coloring on anxiety levels. Furthermore, no studies examine the effects of the leisure activity of coloring on post-test anxiety levels in graduate level students. In this study, we examined the effects of the leisure activity of coloring on the anxiety levels of graduate level occupational therapy students after taking a high stress exam. We also examined the effect of the leisure activity of coloring on the graduate students' perceptions of their preparedness for and performance on the previous exams. We hypothesized that engaging in the leisure activity of coloring for 20 min after taking a high stress exam will reduce post-test anxiety and positively affect graduate students' perceptions of their own preparedness for and performance on the exams. This would decrease the amount of anxiety that a graduate student experiences in college and positively impact learning and school participation.

Method

Participants

The Texas Woman's University institutional review board for the protection of human subjects approved this study. A purposive convenience sample of students in the master of occupational therapy degree program was recruited for this quantitative, pre/posttest study. The participant sample consisted of 41 master of occupational therapy students (37 female) at a major public university in Texas. Twenty students in their first semesters (MOT-I) and 21 students in their fourth semesters (MOT-IV) participated in the study. The participants' ages ranged between 22 and 54 years.

We received permission from the faculty member teaching the classes to recruit students following their final exams. A research assistant assigned each study participant to one of two rooms,

either the leisure activity room or the control room, immediately after the participants left their final exam. Data collection occurred twice: once for the first-year cohort (MOT-I) and once for the second-year cohort (MOT-IV). In both groups, data collection occurred after a final exam in one of the didactic courses. All 41 participants voluntarily completed the intervention and all assessments.

Instrumentation

Data collection was completed using a self-report assessment packet that included a pre and posttest graphic rating scale (GRS) for anxiety, a GRS for the students' perception of their outcome on the previous test, a GRS for the students' perception of their preparedness for the previous test, as well as a demographic form.

The GRS for anxiety pretest consisted of a vertical line with 11 numbered intervals: 0 to 10. The 0 interval stated "not anxious at all" and the 10 interval stated "extremely anxious." The GRS for anxiety posttest was identical to the pretest. The GRS for the students' perception of their outcome on the previous test was modeled after the GRS for anxiety. The 0 interval stated "not well at all" and the 10 interval stated "extremely well." The GRS for the students' perception of their preparedness for the previous test included the 0 interval stating "not prepared at all" and the 10 interval stating "extremely prepared."

Self-report questionnaires often use a GRS, and although scoring requires more effort, the psychometrics fall in line with many other types of scales (Couper, Tourangeau, Conrad, & Singer, 2006). GRSs are one of the best in the usual forms of rating scales, when compared to visual analog scales and other basic visual scales, because they offer a visual picture for the examinee, suggest equal distribution of intervals, and are easy to understand (Couper et al., 2006). GRSs have been shown to exceed the expected standard of 0.70 in test-retest reliability and present a reliable and valid measure for use in clinical settings to measure subjective emotions, such as anxiety, depression, and mood (Dalton & McNaull, 1998; ten Klooster et al., 2006).

In this study, we limited data collection to the subjective measures of stress; we did not collect data on biological markers of stress, such as heart rate and cortisol levels. Gehlert, Bollinger, and Murray (2012) compared biological and non-biological measures of stress and found that a strong correlation between subjective and objective measures of anxiety did not exist. However, they observed the importance and validity of both types of stress measures. Furthermore, the authors state that self-report scales or questionnaires are typically used to measure perceived stress while bio-markers are typically used to measure long-term stress more accurately. Because this study focused on acute, posttest, perceived stress, we chose the self-report scales.

We also provided a demographic form to collect data on age, gender, ethnicity, hand dominance, and the semester of enrollment in the program, either MOT-I or MOT-IV.

Procedures

After the students provided informed consent, they completed the GRS for anxiety pretest. The researcher in the leisure activity room gave each participant a 20-min timer, allowed them to choose a coloring page design and coloring medium, and instructed them to color quietly until the timer sounded. The researcher in the control room gave each participant a 20-min timer and instructed him or her to visit with the other participants until the timer sounded. The control group mimicked the ruminative behaviors that most college students exhibit after a high stress exam. When a timer went off, the participant completed the GRS for anxiety posttest and the second part of the assessment packet before

leaving the room.

Data Analysis

To examine the means of change in anxiety levels immediately after the final exam and the anxiety levels after the intervention, we relied on repeated measures analysis of variance (ANOVA) for both the control group and the leisure group separately. Then, we performed an independent sample *t*-test to compare the means of the change in anxiety levels between the control group and the leisure group. We also used independent sample *t*-tests to compare the participants' perceptions of the outcomes on the previous tests and their perceptions of preparedness for the tests between the leisure group and the control group. We analyzed all data using the Statistical Package for the Social Sciences (SPSS) v24. A $p < .05$ was set as significance.

Results

We examined anxiety level measures for changes over time using a repeated measures ANOVA. The 2 (time) X 2 (group) ANOVA revealed a main effect for time, $F = 116.84$, $p < .001$, indicating that regardless of group, the scores decreased over time. Specifically, for the intervention group, anxiety levels dropped significantly after participating in the 20-min leisure activity ($M = 2.19$, $SD = 1.60$), as compared to basal level ($M = 5.24$, $SD = 1.79$). In the control group, the anxiety levels also significantly dropped after 20 min ($M = 2.80$, $SD = 1.7$), as compared to basal level ($M = 4.55$, $SD = 2.11$) (see Figure 1).

We then conducted an independent *t*-test to compare the means of change between the leisure and control groups ($t = 2.92$ $p = .006$) (see Figure 2). As previously stated, anxiety levels dropped in both groups. However, the participants in the leisure activity group demonstrated a significantly greater reduction in anxiety levels ($M = -3.05$, $SD = 1.66$) than the participants in the control group ($M = -1.75$, $SD = 1.12$).

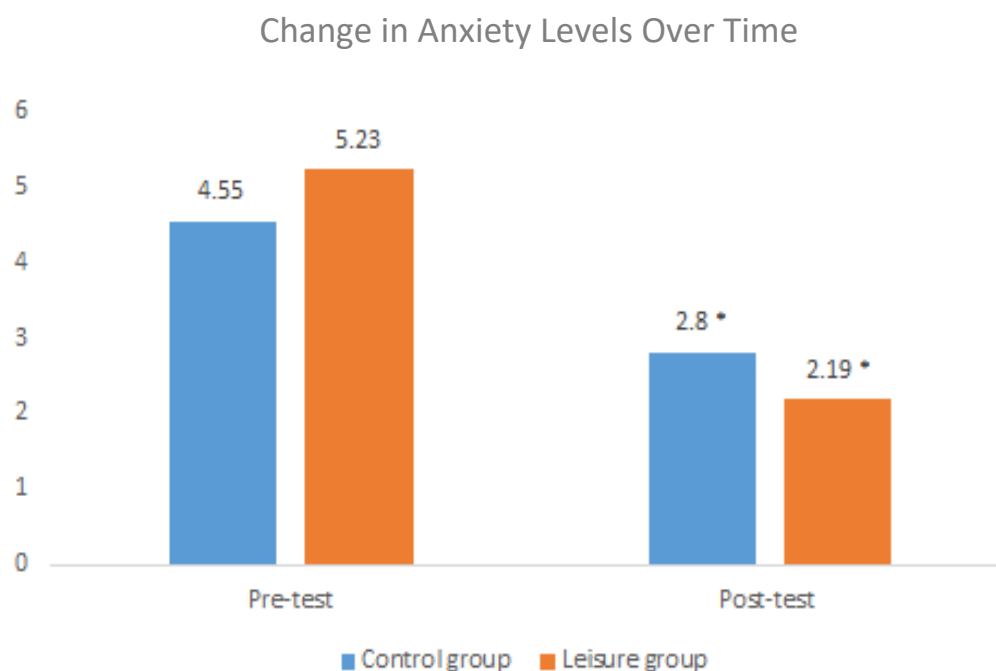


Figure 1. Change in anxiety levels over time.

*indicates $p < .05$ versus pretest.

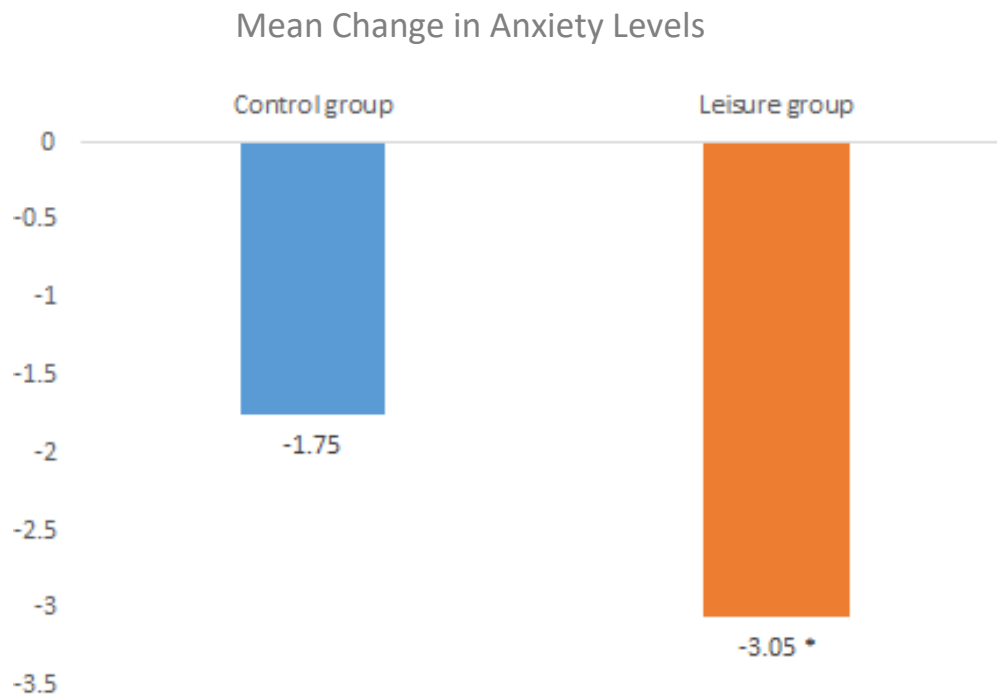


Figure 2. Mean change in anxiety levels.

*indicates $p < .05$ versus control group.

We also conducted two more independent sample t -tests to compare the means of the participants in the 20-min leisure activity group and the means of the participants in the control group on their perceptions of outcomes on the previous tests and their perceptions of preparedness for the tests (see Table 1). The results revealed that neither perceptions of outcomes nor perceptions of preparedness for the previous tests differed between the leisure activity group and the control group ($P_s > .05$).

Table 1

Mean participant perceptions of test outcomes and preparedness

	Variable	<i>n</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>
Perceptions of Outcome					0.518	0.61
Control		20	6.45	1.73		
Leisure		21	6.19	1.47		
Perceptions of Preparedness					-0.051	0.96
Control		20	6.45	1.93		
Leisure		21	6.47	1.32		

Discussion

Our goal was to provide evidence for the use of the creative leisure activity of coloring in a college setting as a nonpharmacological treatment option for the reduction of post-test anxiety in graduate level occupational therapy students. The results of this study support the use of the leisure activity of coloring by showing a significant difference between the control group and the leisure activity group in the reduction of anxiety levels after the 20-min intervention. The reduction of anxiety levels from the pretest score to the posttest score was significantly greater in the leisure activity group as

compared to the control group.

Our findings expand on Curry and Kasser's 2005 study, along with the two replication studies by van der Venet and Serice (2012) and Drake et al. (2014), with evidence for the use of the leisure activity of coloring in the reduction of anxiety after a stressful test as well as the use of the intervention on graduate level students versus undergraduate level students. The current study differed by offering the participants a choice in the pattern they could color instead of giving them a specific pattern to complete. The rationale for offering the choice resulted from the three previous studies, which showed varied results in the significance of the intricacy of the design. The varied findings support the use of multiple designs and intricacy levels as a means of anxiety reduction. Furthermore, the choice of design appeals to participants' personal preferences in coloring page options, which supports the occupation-based theory that autonomy is an integral part of client motivation and satisfaction with a task (Schkade & Schultz, 1992). Another difference observed in the current study included a control group to compare mean differences, as this was a limitation stated in one of the previous studies (Drake et al., 2014). The control group provided an opportunity to control for the typical ruminative behaviors that college students engage in after a high stress exam.

We also examined the effects of the leisure activity of coloring on the graduate students' perceptions of their own preparedness for and performance on the test after the 20 min intervention. However, the results showed no significant difference in perceptions of preparedness for or performance on the test between the control group and the leisure activity group. The limitations in differences between the control group and the leisure activity group could be due to the limited participant sample size.

Theoretical Implications

The study findings support the OA model by showing that focused, creative leisure activities, such as coloring, allow the brain to process post-test anxiety in a productive and beneficial way, ultimately reducing the anxiety college students encounter. The participants in the control group engaged in the typical cathartic behavior of ruminating on the test and reported a significantly higher anxiety levels after 20 min than the students who participated in the leisure activity group. The leisure activity of coloring resulted in a reduction in anxiety by providing an opportunity for the students to relegate stressful post-test ruminations to the secondary level of energy associated with the adaptive response process of the OA model.

Study Limitations and Future Directions

The study's limitations warrant future research. First, the sample size was limited because of the timing of the study. Recruitment occurred immediately after a high stress final exam, which may have contributed to a limited number of students willing to participate in a 30 to 40 min study. Second, the population was a convenience sample consisting of graduate level occupational therapy students from one university. Therefore, the context of the study should be considered when generalizing the findings. Future studies could compare different populations in the occupational therapy community by examining the effects of the intervention on occupational therapy assistant students and occupational therapy PhD students to see if a difference is observed among different program levels in the occupational therapy profession. Furthermore, research should be conducted to look at the effects of the leisure activity of coloring on post-test anxiety in both graduate and undergraduate students across multiple schools and professions to generalize the findings to other college student populations.

The third limitation of this study arises from the lack of consideration for the participants' mental status. Mental status was not controlled for or considered in this study, even though generalized anxiety disorder (GAD) is a common problem in college level students (ACHA, 2016). Future studies may consider looking at the effects of the leisure activity of coloring on post-test anxiety levels in college students who are suffering from GAD and compare the findings to students who do not suffer from GAD.

In addition, the study design offered no control for the difficulty level of the two final exams. It is possible that one of the groups engaged in a more stressful test than the other group. A much larger representative sample size could limit the effects of this variable in future studies.

The use of self-report measures of anxiety and perception may limit findings due to bias. Future studies using objective measures, such as heart rate variability, galvanic skin response, or cortisol levels, would be beneficial in determining if the findings of this study and previous studies could be replicated with objective measures.

The popularity of the leisure activity of coloring among adults in recent years offers additional research opportunities in this area of intervention. Future studies could consider looking at students' stress levels over time while participating consistently in the leisure activity of coloring for an extended period. Also, collecting data on student grade point averages could provide an opportunity to compare how the leisure activity of coloring affects post-test anxiety in students of varied academic success levels.

Conclusion

Creative and meaningful leisure activity is at the foundation of occupational therapy. Yet, few studies have investigated the effects of specific leisure activities on the health and well-being of clients or students. The findings of this study provide evidence for the use of leisure activities, specifically coloring, as a means of mental health promotion in graduate level occupational therapy students. Based on our findings, we conclude that the leisure activity of coloring is an easily accessible and effective tool for the reduction of post-test anxiety in graduate level students. The findings of this study further support the tenant of occupation-based intervention in the OA model in redirecting primary energy toward focused, creative activity to allow the processing of post-test anxiety in a productive way to reduce the anxiety that college students encounter.

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