

Reducing Test Anxiety Through Mind Relaxation in Undergraduate Nursing Students

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Abstract

BACKGROUND:

Anxiety and stress are feelings often experienced during nursing course exams. According to the Yerkes-Dodson Law, enhanced performance occurs at mid-levels of anxiety while low and high levels hinder optimum performance.

PURPOSE:

The purpose of this study was to identify the effect of a Tai Chi (mind relaxation) intervention on test anxiety.

Approach:

Test Anxiety was measured utilizing the Westside Test Anxiety Scale, Zero-to-Ten Self-Anxiety Scale, and pulse rates.

Outcomes:

Thirty-eight undergraduate nursing students enrolled in Health and Illness II during the fall and spring semesters participated in the study. An average of 15 students participated consistently in the Tai Chi intervention. Results demonstrated a significant difference in students' anxiety scores before and after the Tai Chi intervention and with a post Tai Chi intervention anxiety scores reduction to a mid-level ($M=4.73$).

CONCLUSION:

This study supports Tai Chi as an effective intervention before examinations in reducing nursing students' anxiety levels.

Introduction:

Anxiety and stress are relative in situations that provoke feelings of "fight or flight" (Selye, 1976). Nursing students often experience stress and anxiety before and during course exams. According to Gibson (2014) "the attributes of the concept of test anxiety include: administration of a test, negative subjective feelings, behavioral aspects, physical signs, and cognitive aspects".

Yerkes & Dodson (1908) identified that the greater the stimulus the less effective the performance on any given task. Yerkes-Dodson Law reflects that low and high levels of anxiety hinder optimum performance, whereas enhanced performance occurs at mid-levels of arousal or anxiety (1908).

Systematic reviews and meta-analysis have shown Tai Chi to be an effective intervention for general anxiety reduction and psychological well-being (Wang et al., 2013). A systematic review supported the promising physical and psychological well-being Tai Chi provides in diverse clinical settings (Solloway et al., 2016).

Based upon a desire to provide students with a strategy to manage test anxiety, the authors elected to assess if Tai Chi would have an effect on participants' anxiety scores and pulse rates.

Literature Review

According to Selye (1976), anxiety brings about both psychological and physical symptoms as the body prepares for fight-or-flight response. During this response, the brain releases catecholamines resulting in an increased heart rate and muscle tension, in addition to other physical responses (1976). Test anxiety is defined as "an unpleasant feeling or emotional state that has both physiological and behavioral components that are experienced in formal testing or other evaluative situations" (Dusek, 1980). Test anxiety is usually associated with perceptions of dread, worry and expectations of devastating failure (Hembree, 1988). Some of the defining physical attributes of test anxiety may include respiration rate and rhythm, somatic activity (muscle tension), and cardiovascular system changes including heart rate and blood pressure (Zeidner, 1998). Forgetfulness, disorganization or irrelevant thinking reflect the cognitive attributes of anxiety (LeBeau et al., 2010), while behavioral aspects may include distress, tension, apprehension, distraction and avoidance (Zeidner, 1998).

Nursing students are inundated with anxiety producing stressors such as rigorous academic standards, the constant need to perform well on exams in order to meet progression criteria, and family/financial responsibilities (Quinn & Peters, 2017). Research has shown that nursing students tend to have more test anxiety when compared with other students (Evans, Ramsey, & Driscoll, 2010).

Test anxiety has been a recognized concern for years. A qualitative study to determine the lived experience of nursing students' test anxiety revealed that the fear of not becoming a nurse relative to not passing nursing tests resulted in increased test anxiety (Edelman & Ficorelli, 2005). Stojanovic et al. (2017) conducted a study relative to test anxiety in nursing students' pre-exam period. The study demonstrated statistically significant pre-exam anxiety with an average value higher for female students than male students. When the cognitive component of test anxiety was studied, the finding demonstrated a moderate statistically significant lower examination grade for student with high compared with low levels of cognitive test anxiety (CTS). High levels of CTS were associated with reduced academic performance (Duty, Christian, Loftus, & Zappi, 2016).

An integrative review specific to reducing testing anxiety in undergraduate nursing students conducted by Brodersen (2017) found evidence supporting the use of aerobic exercise, aromatherapy, music therapy, collaborative testing, and crib sheets as effective methods to reduce anxiety in undergraduate nursing

students. Tai Chi was not a method examined in the integrative review; however, the author recommended the need to evaluate new interventions to help students with test anxiety.

The Mayo Foundation for Medical Education and Research (2018) defines Tai Chi as a self-paced system of physical exercise and stretching movements based on breathing and graceful movements to help reduce stress and anxiety. Williams (2013) describes various meditation techniques that help students who struggle with exam stress and anxiety, one of those being Tai Chi. All the meditation methods, including Tai Chi, had facets shown to aid in stress reduction helping students develop approaches to cope with the stress of exams (2013). A study on the effect of Tai Chi on anxiety and self-efficacy during undergraduate nursing simulation experiences resulted in statistically significant evidence that Tai Chi decreased student anxiety and increased student simulation performance (Mulcahy, Gosselin, Holland, & Pittman, 2016). Hande, Cloyd, Dietrich & Plummer (2017) researched mindfulness centered stress reduction (MCSR) on graduate nursing students in an accelerated program. Tai Chi was one of the mindful interventions utilized in the study. Participation in the MCSR intervention did not demonstrate a statistically significant correlation with an improvement in stress levels. Researchers theorized that the intense accelerated program had a strong impact on the results (2017).

Specific to test anxiety, Prato & Yucha (2013) provided training in biofeedback-assisted relaxation intervention producing a decrease in physiological responses to stress, without a significant change in subjective test anxiety scores. In a systematic review by Quinn & Peters (2017), a number of different modalities were analyzed; the mode remotely similar to Tai Chi was progressive muscle relaxation. The review stated that nursing students experienced significantly significant lower test anxiety scores after the intervention.

The number of studies specific to the use of Tai Chi on undergraduate nursing students relative to test anxiety is sparse. Based on the limited research specific to Tai Chi, the researchers incorporated Tai Chi as an intervention prior to nursing exams to evaluate the effect on test anxiety. The purpose of this study was to identify the effect of a Tai Chi (mind relaxation) intervention on test anxiety as measured by self-report anxiety scores and heart rate.

Framework

Both Yerkes-Dodson law and Peplau's working definition of anxiety served to guide this study. Yerkes-Dodson Law (1908) theory suggests a relationship between performance and arousal. A mild-moderate amount of anxiety is necessary to perform well, but when that anxiety becomes extensive, performance diminishes. The law first described in 1908 by psychologists Robert Yerkes and John Dodson discovered that increasing stress and arousal levels could help focus motivation and attention on the task, but only up to a certain point. The anxiety experienced prior to and during an exam is one example of how the Yerkes-Dodson Law functions.

An optimal level of stress can help one focus on the test and remember the information; too much test anxiety can impair ability to concentrate making it difficult to remember the content. Arousal levels fluctuate and vary from task to task. Performance levels decrease earlier for complex tasks. If one's arousal levels are too low it might be difficult to remain on task (falling asleep). Too high of arousal levels might

make it difficult to concentrate long enough to complete the task. Relative to this study, an optimal level of stress, mild to moderate level, can help one focus on information learned and remembered during the exam. High levels of test anxiety can impair one's ability to concentrate and focus on the exam (1908).

Peplau's working definition of anxiety identifies four levels of anxiety that all nurses should be able to identify in their clients or students. Those four levels are comparative to the levels addressed in Yerkes-Dodson Law: Mild, Moderate, Severe, and Panic. Peplau defines mild anxiety as the level that prepares one for performance. This level sharpens senses, increase motivation and enhances learning. As anxiety increases one's ability to remain on task, function and learn decreases. When one reaches, the panic level misperceptions may occur and eventually lose of contact with reality.

Methods

Design

This quasi-experimental study was conducted over ten months at a university in Northwest Kansas. Approval for the study was obtained from the University's Institutional Review Board prior to initiation. The study was originally designed as a quantitative experimental study with a control and experimental groups. After an experimental pilot study it was determined that due to a small target population, a quantitative quasi-experimental design utilizing pre and post intervention quantitative data would improve the study sample and data findings. Utilizing this design, data was collected pre and post Tai Chi intervention on all scheduled Health and Illness II examinations days. Another modification after the pilot study was of the use of the Westside Test Anxiety Scale to replace the Generalized Anxiety Scale. The rationale for the modification was that the Westside Test Anxiety scale was specific to test anxiety, the focus of this study.

The Tai Chi sessions were conducted in a classroom with adequate space for the activity. Students followed beginning Tai Chi movements from a 15-minute You-Tube video selected for the study. Lighting in the room consisted of three lamps, each with a 40-watt incandescent bulb. A Likert style question survey with comments was sent via Survey Monkey after completion of the course to ascertain specific students' responses to the Tai Chi intervention.

Sample

All second semester nursing students enrolled in Health and Illness II in the Baccalaureate of Science in Nursing (BSN), nursing program during the fall 2017 and spring 2018 semesters were invited to participate. Recruitment and enrollment occurred one week prior to the first scheduled examination in the course. Forty-eight students were invited to participate in the study. Of the 48 students, five students were male and 43 students were female. The majority of the student population was Caucasian, with 15% being of Hispanic ethnicity.

Procedure

Students were informed of the study and the benefits of Tai Chi including its demonstrated ability to reduce anxiety. Questions regarding the study were answered upon which time all students were provided informed consents. Students completed or left blank (those students opting out) the consent forms and placed them in a manila envelope provided on the desk in the front of the room. As consent forms were

returned, students selected a random number as their identifier. All participating students were asked to complete the baseline information as follows: The Westside Test Anxiety Scale electronic version: <http://www.testanxietycontrol.com/tests/scaleauto.htm> and a hard copy of the Numeric Visual Analog Anxiety Scale. This scale was only utilized at the beginning and end of the semester as a baseline to assess whether Tai Chi continued use of effected over-all testing anxiety.

Students obtained their own pulse rate utilizing the HoMedics Deluxe Pulse Oximeter. Students participating in the study recorded the results of the three measures mentioned above on their Numeric Visual Analog Anxiety Scale paper along with their selected identifying number.

On exam days all participating students met in a designated classroom 20 minutes prior to exam time. Students completed the Numeric Visual Analog Anxiety Scale (Self-Report Data) and obtained their pulse rate with the HoMedics Deluxe Pulse Oximeter.

Students then participated in fifteen minutes of beginning Tai Chi guided by video of easy, slow Tai Chi movements accompanied with suggested breathing patterns. After the Tai Chi activity, the students again completed the Numeric Visual Analog Anxiety Scale and obtained their pulse rate with the same HoMedics Deluxe Pulse Oximeter used earlier. Students proceeded to their classroom to take the Health and Illness II exam. After the final examination, participants also completed the Westside Anxiety Scale to compare the final score to the beginning score for overall effects of the intervention. At the completion of the semester all participants received a three question Likert Scale Survey with comments section via Survey Monkey (self-report data).

During the pilot study, all students' baseline anxiety levels were assessed utilizing the Generalized Anxiety Disorder 7-item Scale (GAD)-7. The GAD-7 has been shown to be a valid tool for assessing Generalized Anxiety in practice and research (Spitzer, Kroenke, Williams, & Lowe, 2006). Upon completion of the pilot study, the researchers elected to modify the baseline, anxiety measure from the GAD-7 to the Westside Test Anxiety Scale relative to the study's intent to measure test anxiety.

The Westside Test Anxiety Scale, utilized in the study has been shown to be a valid and reliable instrument measure for identifying students with anxiety concerns who could potentially benefit from anxiety-reducing interventions (Driscoll (2007). The scale combines six items assessing impairment, four items on worry and dread, and no items on physiological over-arousal. Results reflect an alpha reliability of 0.44 establishing the scale as a reliable and valid measure of test-anxiety impairment (2007). These findings were similar to previous research study findings (Cassady & Johnson, 2001, Alpert & Haber, 1960).

Anxiety levels during the study were assessed utilizing the self-report Numeric Visual Analog Anxiety Scale (NVAAS). Pulse rates were assessed utilizing the Smart Pulse Advanced Finger Oximeter. The NVAAS consists of a numeric anxiety scale with no anxiety at one end (0) and the worst anxiety you can imagine at the other end (10). Individuals are asked to rate their anxiety from 0 to 10. The NVAAS correlated significantly with State Trait Anxiety Inventory-State anxiety (0.64, $p < .0001$) demonstrating to have validity as a self-report scale to assess state anxiety (Elkins, Staniunas, Rajab, Marcus, & Snyder, 2004).

Pulse rates throughout the study were assessed utilizing the HoMedics Deluxe Pulse Oximeter. The measurement accuracy of the HoMedics Deluxe Pulse Oximeter SpO₂: 70% ~ 99% ±3%; ≤69%, unspecified. PR: 30 ~ 99 bpm ±2 bpm; 100 ~ 235 bpm ±2% for lay use (Beijing Choice Electronic Technology Co., Ltd., n.d.).

Thirty-eight students initially started the study with an average of 15 students consistently participating. At the end of the spring 2018 semester, utilizing the Statistical Package for the Social Science (SPSS) software system, data were analyzed for descriptive and inferential analysis. The Wilcoxon matched-pairs statistic for median comparison of pre and post intervention data was used. Due to a small sample size, not all assumptions were met to utilize the paired t-test. The Wilcoxon matched-pairs test is a non-parametric test used to determine whether a relationship exists between two correlated measures of the same variable in which the measurement scale of the variable is at least ordinal. The Wilcoxon matched-pairs test tests the null hypothesis that the medians of the two correlated groups are equal (Kellar & Kelvin, 2013).

Based on quantitative data analysis, the following research questions were answered: Is there a difference in participants’ state anxiety scores before and after the Tai Chi intervention? Is there a difference in participant’s pulse rate before and after Tai Chi? Does a Tai Chi intervention reduce anxiety to a mid-level for optimum performance?

Results

Students’ self-reported anxiety scores before the Tai Chi intervention were moderate (M=5.92-6.45) whereas the post Tai Chi anxiety scores were less (M=4.30-5.36). The pre and post Tai Chi anxiety comparison of means were significant for all examinations. The pre-intervention pulse rate averages were moderate (M=82-90) and did not differ significantly post intervention (M=85-88). Pre and post pulse rate comparison of means were not significant. See Table for statistics.

Table. Wilcoxon Matched-Pairs test of Anxiety scores and Pulse rates of Nursing Students Pre & Post Tai Chi

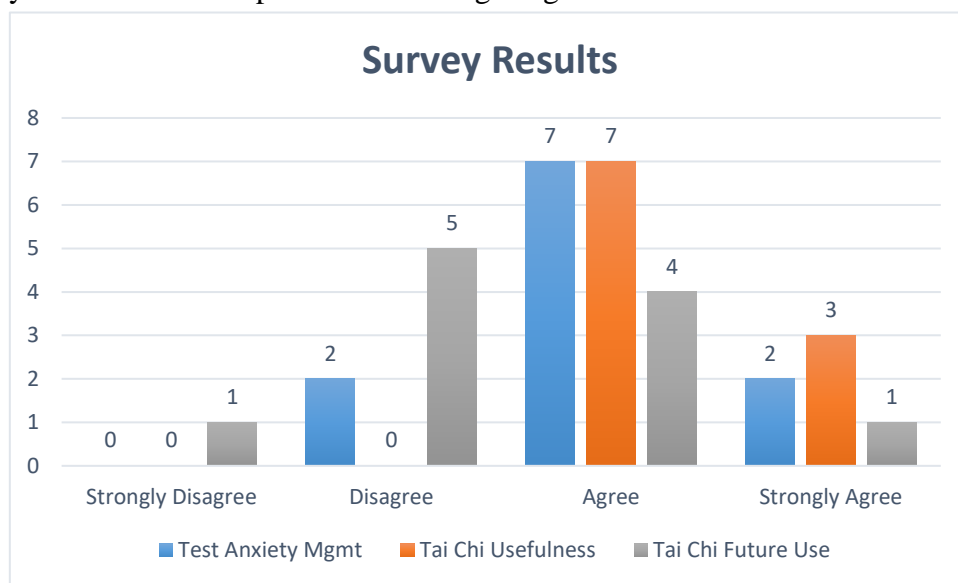
Category	Pre Tai Chi			Post Tai Chi			Wilcoxon Matched-Pairs test
	N	Mean	Standard Deviation	N	Mean	Standard Deviation	p-value alpha .05
Westside (0-5 scale)	38	3.31	.64	11	3.05	.91	
Anxiety (0-10 scale)	35	3.69	2.29				
Anxiety Test 1	20	6.45	1.99	20	4.30	1.63	.001*
Anxiety Test 2	16	6.25	2.05	16	4.88	2.22	.005*
Anxiety Test 3	14	6.43	1.09	14	4.57	1.45	.001*

Anxiety Test 4	12	5.92	2.23	11	5.36	1.29	.010*
Anxiety Average	21	6.17	2.07	21	4.73	1.54	
Pulse Baseline	37	78.89	10.89				
Pulse Test 1	20	88.20	17.10	20	87.85	15.31	.948
Pulse Test 2	16	82.69	13.66	16	85.44	15.21	.306
Pulse Test 3	14	90.50	19.76	14	88.00	16.91	.379
Pulse Test 4	12	85.33	15.28	12	88.58	15.28	.894
Pulse Average	22	88.21	15.39	22	88.24	13.66	

*p-value significant at <.05

Regarding the survey results, 82% of students agreed/strongly agreed the Tai Chi intervention helped manage their test anxiety. One hundred percent (100%) agreed/strongly agreed that Tai Chi was useful. However, only 45% stated they would use Tai Chi in the future for anxiety management. See Figure 1 for survey results.

Figure 1. Survey Results after completion of Nursing Program course and Tai Chi intervention.



The comments received in the survey support the students’ favorableness of the activity. Students recognized Tai Chi as a technique to help with mind and body relaxation. “Doing Tai Chi before exams helped me to not think about the test and calm my nerves.” Responses regarding Tai Chi’s usefulness before examinations varied as some appreciated the distraction before the examination but others were never able to relax fully, as they were preoccupied with the upcoming examination. “Although it did ease my anxiety before exams, I don’t know that I would be able to continue this throughout the program”.

Discussion

Similar to the study by Mulcahy, Gosselin, Holland, & Pittman, (2016) the data supported research question #1, as there was a significant difference in students' anxiety scores before and after the Tai Chi intervention. Research question #2 was not supported, as there was not a significant difference in students' pulse rate pre and post Tai Chi intervention. Research question #3 was supported as students' post Tai Chi intervention anxiety scores were reduced to a mid-level (M=4.73) for optimum performance. An average of 15 students participated consistently in the Tai Chi intervention sessions.

The quantitative data results indicated a report in reduction of pre-examination anxiety scores with the Tai Chi intervention before the examination. On average students' anxiety decreased from a self-reported score of 6 to 4. This significant decrease allowed students to proceed with their nursing examination in a more controlled anxiety state to maximize academic performance. This study adds new knowledge to nursing research, as there is limited interventional studies regarding nursing students and the use of Tai Chi to reduce test anxiety.

Limitations

The lack of randomization of students is a major limitation of this study. Generalizability of the findings is limited by the characteristics of the sample: female, nursing students. The study is also limited by the small sample size. Small sample size was in part associated with the student's having developed pre-exams methods to prepare prior to exams, whether those methods were effective or not for reducing test anxiety. Due to the lack for research specific to this topic and the lack of randomization of this and other studies relative to Tai Chi and anxiety reduction it is recommended that randomized studies specific to the use of Tai Chi as a method of reducing test anxiety be conducted with larger sample sizes.

Implications for Nursing

The results of this study add support to the use of Tai Chi as a form of test anxiety reduction in nursing students. A safe and enjoyable exercise can be learned in a short amount of time to aid in anxiety reduction through controlled breathing and movements. Nursing students and practicing nurses can use Tai Chi to decrease anxiety in not only test situations but other situations including pre or post clinical or shift.

Conclusion

Nursing students verbally report high levels of test anxiety. High levels of anxiety have been shown to hinder optimum performance, where mid-levels of anxiety increase performance (1908). Tai Chi as a low impact form of exercise achieves a relaxation of both the mind and body. This study verified that Tai Chi as an intervention before examinations reduced nursing students' anxiety levels. However, Tai Chi intervention did not reduce the students' pulse rate. One could consider Tai Chi a mild form of exercise that may have increased the pulse rate. This study adds support to the use of Tai Chi as a means to reduce test anxiety. Based on the findings from this limited study and prior research, Tai chi appears to be an alternative technique for reducing test anxiety.

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