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Aromatherapy for Test Anxiety in College Students: A Literature Review

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ABSTRACT

Objective: It is common for college students to experience anxiety, especially in high-stakes testing environments, which may lead to poor test scores. Exploring strategies that may reduce or limit anxiety would be beneficial for students who experience debilitating test anxiety, ultimately improving their academic performance. This paper explores the effects of aromatherapy amongst college students with elevated levels of anxiety when taking tests.

Methods: The literature was searched using PubMed, Google Scholar, and EBSCOhost. Indexing terms included *Aromatherapy for Test Anxiety* in the English language only. Studies were chosen if they analyzed the impact of aromatherapy on test anxiety at the college level. Ten articles were initially chosen; after review, 4 articles were selected for further examination.

Results: Three of the 4 studies had comparable results. When aromatherapy was used, test anxiety was reduced. However, in 1 study there was no difference in anxiety levels between groups. Essential oils used for the aromatherapy included lemon, lavender, and rosemary.

Conclusion: At college level, aromatherapy may be an effective method to reduce test anxiety according to three out of four studies. Using aromatherapy in testing environments for students who have test-related anxiety may be a good option to help students. Further evaluation is needed to correlate the impact of aromatherapy on anxiety and exam scores before a definitive conclusion can be drawn. *(J Contemporary Chiropr 2018;1:3-8)*

Key Indexing Terms: Aromatherapy; Test Anxiety; College; Nursing; Chiropractic

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INTRODUCTION

Test anxiety is on the rise in college students due to pressure to perform well on high-stakes examinations (1). Test anxiety (TA) is a category of anxiety where students experience anxious feelings over a testing situation (1). There are several causes for TA, including previous testing experiences, time constraints, comparison with classmates, self-doubt, fear of not finishing on time, failure, and forgetting (2-3). TA can have negative effects on mental, emotional, and physical health (2, 4).

Mentally, students may struggle with focusing and recalling information. Some may also demonstrate avoidance behaviors, such as worrying and not studying (2, 4). Emotionally, students may suffer from negative thoughts, emotional isolation, and depression as a result of TA (3,5). This can lead to decreased ability to be engaged in activities and affect subjective well-being (4). Physically, increased anxiety can affect the nervous system by inhibiting parasympathetic activity and increasing sympathetic activity, which affects heart rate and mental effort(6).

Along with physical and emotional factors, TA can also negatively impact students academically (1, 7). Research on test taking, administration, and preparation regarding reducing TA is crucial for helping students succeed (1). The current guidelines from the Americans with Disabilities Act include allowing students special accommodations such as extra time and a distraction-free room (8). To receive accommodations, a student's TA must be a mental impairment that substantially limits one's testing ability (9). To the best of our knowledge, there is no evidence in the guidelines to reduce TA other than receiving accommodations under the Americans with Disabilities Act (9).

Aromatherapy has been shown to be an option for reducing TA in college students (10-13). Aromatherapy is a natural treatment using chemical structure and effects of essential oils, which are extracted and distilled from a plant's flower, bark, stems, roots, peel, or leaf (14-17). Aromatherapy can be beneficial for the health and education of college students and may be linked to positive physiological effects and improved exam scores (7) .

Essential oils can be absorbed into the body through the olfactory system, which is connected to the limbic

system, and thus may relate to human emotions (18). Different aromas cause nerve cells to release different neurotransmitters, which include encephalin, endorphin, noradrenaline, and serotonin, which can change humans feelings (15). The mechanism of action for essential oil is that the smell passes along the nasal cavity and directly diffuses into the olfactory epithelium, and then the stimulus travels via the olfactory nerve to the limbic system in the brain, which plays an intricate role in human arousal and emotions (17). The goal of this paper is to do a literature review on aromatherapy for TA in college students.

Table 1. PRISMA Method Guidelines

PRISMA Method Guideline	Our Study Methods
Eligibility Criteria	
Study Design	Controlled trials, cohort studies, cross-over studies
Years Considered	2007-2017
Participant Characteristics	College Students
Intervention	Aromatherapy
Outcomes	TA Measurements
Language	English
Setting	Colleges
Information Sources	PubMed, Google Scholar, EBSCOhost
Search Strategy	Aromatherapy for test anxiety in college students was typed into the search engines
Study Records	
Data Management	BW and KH each did a search and kept track of the articles for review with Excel
Selection Process	Two independent reviewers read abstracts of the studies for screening, eligibility, and inclusion and compared.
Data Collection Process	BW collected data from the articles in a table and shared it with KH
Data Items	Included in Table 3
Outcomes	TA reduction had to be assessed using aromatherapy as an intervention
Risk of bias	Included in Table 3

METHODS

A literature search was conducted using PubMed, Google Scholar, and EBSCOhost. Search terms included *Aromatherapy for Test Anxiety* in college students in the English language. Articles were examined further if they included information about aromatherapy being used as an intervention for TA in college students. Articles were discussed between 2 researchers for inclusion decisions. The preferred reporting items for systematic review from PRISMA are included in Table 1 (19).

RESULTS

According to the PRISMA Preferred Reporting Guidelines, 10 articles were initially selected for screening; 6, however, did not meet the eligibility criteria because they did not study students at the college level, methods were not clearly described, or they only examined general anxiety or stress levels, not TA (Table 2) (19). Four articles met the eligibility criteria and were selected because they measured the influence of aromatherapy on TA in college students (10, 11, 13, 20). Lower TA was associated with improved academic performance (11). Additional findings comparing gender and age with TA levels were also noted (10, 11, 20). Findings from the four studies are summarized in Table 3.

Table 2. PRISMA Reporting Guidelines

PRISMA Reporting Guidelines	Number of Articles
Identification and Screening	
Number of articles identified and screened	10
Number of articles excluded	6
Included	
Number of studies included in synthesis	4

Table 3. Summary of study background and findings

Study Design	Sample Size and Justification	Outcome Measures	Intervention	Blinding	Results	Reporting Adverse Outcomes
Quasi-experimental, pre-and posttest measures (13)	40 nursing students. Power analysis included.	Pre/post-test measures of Test Anxiety Scale (TAS), Pulse and blood pressure	Lavender oil sachet inhalation during exam Rosemary oil Sachet Inhalation during exam	None	1. TAS reduction: lavender (p=.001) rosemary (p=.001). 2. Pulse: lavender: (p=.001) rosemary: (p=.03) 3. Lavender: (p=.30). rosemary: (p=.78) No changes in BP	Some students reported decreased concentration while inhaling lavender.
Prospective Randomized controlled trial (11)	50 nursing students. No power analysis.	State Trait Anxiety Inventory (STAI)	10 Lavender aromatherapy incense 15 minutes before and during an exam	None	Mean STAI was lower in the intervention group and statistically significant (p=.001).	None
Quantitative, randomized pretest-posttest design (10)	39 nursing students. No power analysis.	Cognitive Test Anxiety Scale (CTAS).	Lemon aromatherapy during an exam	None	Statistically significant decrease in CTAS for the intervention group (p=.01).	None
Randomized clinical trial (20)	186 female medical students. Power analysis included.	TAS	30 grams of dried lavender flower with 500 ml water on a cotton ball 5 cm away from nose	None	There were no statistically significant differences in mean CTAS scores (p=.32).	None

BP=Blood Pressure

McCaffrey and colleagues (2009) examined the influence of aromatherapy for test-taking stress and anxiety in a nursing course during the students' first 3 exams of a 4-exam course. The first exam was used as a control where students completed the Test Anxiety Scale (TAS) and had his or her blood pressure and pulse measured pre- and post-test. During the second exam, students completed the pre and post-test measures with a lavender essential oil inhaler that was used before and during the test. During the third exam, students completed the same measures but received a rosemary essential oil inhaler. The inhalers included a piece of cotton with 3 drops of the essential oil (13). The pulse rates went down after the use of lavender essential oils from 78 beats per minute to 70. Similar results were found in the rosemary essential oil group with beats of 78 beats per minute to 71 (13).

Qualitative questions showed that students thought the lavender smell was pleasant but may have increased relaxation and decreased concentration. All participants liked rosemary and thought it increased their ability to concentrate and recall information. Overall, students experienced a reduction on the TAS and pulse rates while using lavender and rosemary essential oil inhalers.

Kutlu and colleagues (2008) examined the effects of aromatherapy on TA as well as attention, concentration, and memory of midwifery nursing students. The study group took an exam in an enclosed room with 10 lavender incenses. The main finding was the intervention group had lower anxiety than the control group. Another interesting finding academically, was the mean test score in the study group was higher than the control group (11).

Johnson (2014) studied the influence of lemon aromatherapy on TA. The students completed the CTAS the day before and the day after an examination in which the intervention group took in a room diffused with lemon essential oils and the control group took in a room without essential oils diffused. The study concluded that lemon essential oil was an effective means to reduce TA among nursing students (10).

Bekhradi and Vakilian (2016) preformed a randomized controlled trial to analyze the effects of lavender aromatherapy on TA in female medical students. The intervention group inhaled lavender aromatherapy for 5 minutes of sleep for 7 nights—the control group did not. Both groups completed the TAS before and after the seven-day trial. The mean TAS level reduced in the intervention group, but it was not statistically significant (p=.32). The major finding was the number of anxiety-free students increased in the intervention group. The study concluded that anxiety level can be controlled using lavender in some cases (20).

DISCUSSION

Findings from 3 out of the 4 studies conclude that aromatherapy can be useful in reducing TA (10, 11, 13). All studies were heterogenous from each other, which may be why this study may have had different results. The methodological design was different than the other studies in that it did not surround a particular testing situation. Rather, it was over a week-long period where several outside factors may have contributed to anxiety or lack thereof. Therefore, several other factors could have influenced anxiety scores.

All 4 studies that met the eligibility criteria mentioned the potential negative effects of TA in relation to academic performance (10, 11, 13, 20). Researchers also mentioned that high-stakes tests can lead to increased student TA (10, 13). Innovative ideas to help reduce students' TA should be incorporated into classrooms to help reduce TA and increase test taking capabilities to help students succeed (10, 11, 13, 10). Essential oils can be safe, inexpensive, and easy to implement in the classroom (10, 13). Aromatherapy may also help several other cognitive disorders such as depression, chronic pain, treatment anxiety, and insomnia (11, 21).

Other research on aromatherapy found similar results to our study in regards to the influence of aromatherapy on anxiety (21–23). Lehner and colleagues studied 200 dental patients between 18 and 77 years of age and found that lavender and orange aromatherapy decreased anxiety and improved mood in patients (23). Another study of dental patients by Zabirunnissa enrolled 597 patients into a control group and a lavender aromatherapy intervention group and showed a significant reduction in anxiety levels (21). Additionally, a study of the effects of lavender aromatherapy inhaled 30 minutes prior to intrauterine device insertion showed a decrease in anxiety and pain levels (22).

In contrast with the other 3 study results, the Bekhardi study also showed no significant difference when using lavender aromatherapy (20). Furthermore, the McCaffery study discovered, through qualitative data from students, that lavender may be too relaxing and decreased focus, attention, and critical thinking. These findings correlate with findings from Moss *et al* that suggest lavender produces a decrease in working memory and alertness (16). This information shows a link between essential oils and cognitive performance. Regarding TA, some research suggests that it can be used to motivate students (24). Therefore, future studies should separate out students who suffer from debilitating TA and those who use it to motivate them.

Lavender was the most frequently used oil among the studies, potentially because of its relaxing effects and because it was used in previous research to study cognitive effects (14, 17). A systematic review of 16 randomized controlled trials studies show that aromatherapy, lavender in particular, has positive effects to reduce anxiety symptoms (15). Linalyl acetate and B-linalool are active components in lavender which have sedative, analgesic, and anxiolytic properties for treating pain, anxiety, and stress. The hippocampal region is affected by lavender, which creates an anxiolytic effect by inhibiting voltage-gated calcium channels. Additionally, autonomic arousal is suppressed with lavender (11, 14, 17).

Additional information to consider is that the majority of participants were in a nursing program (11, 13) and were female (20). Furthermore, in the Kutlu study, males and females were compared and female students in the study group had higher mean anxiety than males in the study group (11). Females might have more emotional reactions to conditions which cause anxiety (25). Participants also tended to be in their 20s (10). Additional findings were that the mean anxiety scores of students older than 20 years were higher than students 20 years or younger (11).

One of the aforementioned studies used the CTAS, 2 studies used the TAS, and 1 study used the STAI. Johnson concluded that the CTAS was a reliable instrument, with a Cronbach's alpha of .92, which was comparable with other studies (10). The reliability or validity of the STAI was not discussed in Kutlus article (11). The reliability of the TAS was discussed, with a Cronbach's alpha of .85, in the McCaffrey study, and .78 in the Bekhardi study (13, 20). There is not 1 consensus on the best method to measure TA; however, a new measurement for TA specifically in college students is available: the Test Anxiety Measure for College Students (26). A study conducted with 720

graduate students confirms it is a valid survey instrument, with a Cronbach's alpha ranging from .75-.95. The Test Anxiety Measure for College Students may be an option to use when measuring TA in future studies (26).

We included aspects of the PRISMA guidelines in our review; however, we did not do a qualitative analysis or a meta-analysis of the information. We did not do a comparison of interventions because it was not the goal of this paper. Prioritization of outcomes was not completed because we only had 1 outcome we were looking for in the review. Data synthesis was not discussed because this is not a systematic review (19).

Helping students do their best should be the goal for academic institutions. Aromatherapy is an inexpensive and simple method to help decrease student TA. Because a decrease in TA is associated to better test scores (7), it may be a method to consider when structuring testing situations.

Limitations
Improvements to this study include searching more databases and obtaining all articles on the subject. Additionally, there was no quality assessment for the articles. This was not a systematic review, which would provide a more though examination of the question.

CONCLUSION

Aromatherapy may be beneficial in reducing TA among college students. Innovative test-taking strategies to reduce student TA can potentially lead to better academic performance and should be considered to help students perform at their best. Future aromatherapy research studies should examine more males and other professional degree programs for increased generalizability. Additionally, studies should separate students who suffer from TA from those who use it as a motivator. Studies should also report adverse events and attempt to blind students.

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