

9-1-2018

## Physical Activity and State Anxiety: Does Physical activity Among College Students Affect State Anxiety?

Theodore Mickelson  
*Winona State University*

Follow this and additional works at: <https://openriver.winona.edu/studentgrants2019>

---

### Recommended Citation

Mickelson, Theodore, "Physical Activity and State Anxiety: Does Physical activity Among College Students Affect State Anxiety?" (2018). *Student Research and Creative Projects 2018-2019*. 10.  
<https://openriver.winona.edu/studentgrants2019/10>

This Grant is brought to you for free and open access by the Grants & Sponsored Projects at OpenRiver. It has been accepted for inclusion in Student Research and Creative Projects 2018-2019 by an authorized administrator of OpenRiver. For more information, please contact [klarson@winona.edu](mailto:klarson@winona.edu).

Physical Activity and State Anxiety

Theodore Mickelson

Winona State University

Author Note

Theodore Mickelson, Psychology Department, Winona State University

Questions or concerns about this article should be addressed to Theodore Mickelson

Department of Psychology, Winona State University, Winona, MN 55987. E-mail:

[TMickelson14@winona.edu](mailto:TMickelson14@winona.edu)

## Abstract

With the rise of anxiety within the United States, it is crucial to find safe and effective ways to alleviate symptoms. The purpose of this study was to examine how walking on a treadmill, participating in yoga, or quietly reading impacts state anxiety. This study included 40 ( $N=40$ ) students studying psychology at Winona State University. Participants were randomly assigned to one of the three conditions. Participants completed the STAI-AD, an anxiety inventory measuring state and trait anxiety, before and after receiving their assigned condition. Analysis was done using a mixed between-within subjects' analysis of variance to see if one condition was more effective than another in alleviating state anxiety. Results indicated that no condition was more effective in reducing anxiety. Results did indicate that time had a significant main effect. A one-way ANOVA was conducted to compare the mean change of anxiety within each condition. Results indicated there was not a significant change in anxiety between conditions. Another one-way ANOVA was conducted to compare mean pre-condition state anxiety for each condition. The results indicated there was not a significant difference between the treatments pre-condition state anxiety. These findings indicate that anxiety may be reduced by taking 20 minutes to go for a walk, participating in yoga, or reading.

*Keywords:* state anxiety, STAI-AD, walking, yoga, reading

### Physical Activity and State Anxiety

Physical activity is crucial in order to increase health and quality of life. It has been well documented how exercise increases physical health, but what exercise has also shown to improve is mental health. Not only does physical activity help alleviate symptoms of mental illnesses such as anxiety and depression, but it also increases cognitive function, life satisfaction and overall psychological well-being (Carek, Laibstain, & Carek, 2011). An issue within the United States is the amount of physical inactivity. Research conducted by Caspersen, Pereira, and Curran (2000) further investigated physical activity trends, across age and sex within the United States. Results showed that males exercise more than females, but the amount was still not sufficient among either sex. Another finding is that from adolescence into adulthood, exercise sees a steady decline (Caspersen et al., 2000). It should not be a surprise that anxiety continues to increase over that same period. Raja Mahmoud, Staten, Hall, and Lennie (2012) investigated anxiety among undergraduate students. Of the 508 participants in their study, 27% were reported to have anxiety. It is estimated that 40 million Americans suffer from anxiety and 75% of those experience it prior to age 22 (Raja et al., 2012). Because of the high prevalence of anxiety, it is important to research how to alleviate the symptoms.

One issue with mental illness is the stigma associated with it. Individuals must first recognize symptoms and then feel comfortable enough to seek care. One study found that only 47% of individuals who experienced anxiety, depression, or both, had been seeking care to alleviate the symptoms (Wallerblad, Möller, & Forsell, 2012). After seeking treatment, one option for treating anxiety is with antidepressant medication. This form of treatment can be expensive and may come with a number of side effects. One of the biggest problems with antidepressant medications is that they may take weeks or months to reach their full intended

effect (Machado-Vieira et al., 2010). In addition, research found that during the first month of using medication, individuals are at a greater risk of suicidal thoughts and behavior (Machado-Vieira et al., 2010). One other issue is that around one-third of patients do not respond to the first prescribed medication (Carek et al., 2011). As a result, individuals may go months without the alleviation of their symptoms of anxiety. Finding the quickest and most effective treatment for those battling suicidal thoughts is crucial. For those wanting immediate alleviation of their symptoms, physical activity has shown to be effective.

Research conducted by Bahrke and Morgan (1978) investigated means of alleviating state anxiety. State anxiety is defined as the “unpleasant emotional arousal in face of threatening demands or dangers” (Schwarzer). Bahrke and Morgan (1978) split participants into three groups: exercise, meditation, and a control group and measured their state anxiety before and after the treatment. Results found that all three conditions led to a significant decrease in state anxiety. A study done by Goodwin (2003) also investigated exercise’s impact on anxiety. Goodwin took a random sample of 5,877 individuals ranging from 15-54 years old. The results support exercise as a means of alleviating symptoms of anxiety. Those who engaged in regular physical activity were associated with a significant decrease in the likelihood of having several anxiety disorders. The reason exercise is effective in reducing anxiety may be due to changes that occur in the brain.

One of the main reasons exercise works is through altering chemicals in the brain. Research has found that those with symptoms of anxiety are similar to those with depression, in that they both have smaller hippocampal volumes (Sheline, 2011). For this reason, further research investigated neuronal growth within the hippocampus in the treatment of anxiety (Anderson & Shivakumar, 2013). The hippocampus was found to be extremely sensitive to

glucocorticoids, such as cortisol, which results in impairing neurogenesis and decreasing the hippocampal volume (Anderson & Shivakumar, 2013). Exercise has been shown to increase hippocampal neurogenesis, resulting in an increase of hippocampal volume and the alleviation of anxiety (Carek et al., 2011). This is similar to the way that antidepressants work. Scientists have elucidated a couple of mechanisms that may be the cause for neurogenesis while exercising. Both  $\beta$ -endorphins and serotonin increase during exercise which may be the reason for neurogenesis (Carek et al., 2011). The changes throughout the brain help to explain why exercise helps to alleviate anxiety.

These observations indicate that further analysis of the effects of exercise on anxiety is justified. Therefore, in the current study, I further investigated the impact that walking on a treadmill, yoga, or reading have on state anxiety. Based on past research, I hypothesized that each condition would decrease state anxiety. I also hypothesized that yoga will have the greatest effect in alleviating anxiety, because yoga is a mind and body workout.

## **Methods**

### **Participants**

Forty students ( $N=40$ , 32 females, 8 males,  $M_{age}=20.1$ , age range 18-23) from Winona State University's Psychology Department were recruited via a sign-up sheet to serve as participants. The participants were randomly assigned to one of the three conditions: exercise ( $N=15$ ), yoga ( $N=13$ ), or quiet reading ( $N=12$ ). The students were compensated in the form of extra credit in their psychology courses.

### **Materials and Procedure**

In this study, I replicated Bahrke and Morgan's (1978) study with several significant changes. In Bahrke and Morgan's study, they used meditation while I will be using yoga. Since yoga works the mind and the body, it was hypothesized that it will have a greater influence on anxiety. The other change is regarding the exercise condition. Bahrke and Morgan had participants run on the treadmill at a rate that was 70% of their maximal heart rate. Since this level of activity may be dangerous for some participants. We required participants to walk at a speed of 3 miles per hour. Each condition was measured for anxiety using the STAI-AD before and after treatment. The STAI-AD is a 40-item assessment that measures state and trait anxiety among adults. The exercise condition required participants to walk at 3 mph on a treadmill for 20 minutes. The treadmill was located in the psychology department in a quiet and isolated room. During the yoga condition participants watched the YouTube video: "*Yoga For Complete Beginners - 20 Minute Home Yoga Workout!*", where yoga is taught for 20 minutes, by Adrien Mishler a yoga instructor. The control condition required that each participant sit in a quiet room for 20 minutes with a magazine to read. Controls read the magazine, *Martha Stewart's Living* NO. 291. This issue was edited so that there no articles related to exercise or relaxation techniques. The magazine should be a neutral stimulus and not influence the participant by providing relaxation techniques. The participants were not allowed to use their phone while participating in the study. Participants also completed on the STAI-AD immediately after completing the procedure. The researcher waited outside the room while the participants were completing the STAI-AD and their condition. A mixed between-within subjects' analysis was used to see which condition produced the greatest decrease.

## Results

Figure 1 displays the results of the differences within and among conditions. A mixed between-within subjects' analysis of variance was conducted to assess whether there were differences among the conditions. There was a significant reduction in anxiety from the pre-condition to the post-condition. Wilks' Lambda= .49,  $F(1,37)=38.94$ ,  $p<.05$ , partial eta squared=.51. Each treatment condition showed a significant alleviation of anxiety. The main effect comparing these three treatments was not significant,  $F(2,37)=1.94$ ,  $p=.16$ , partial eta squared=.1. The results suggested there was no difference in the effectiveness of the three conditions in alleviating anxiety. This did not support my hypothesis that yoga would show be the most effective condition.

A one-way ANOVA was conducted to compare the mean change of anxiety within each condition. The means and standard deviations are presented in Table 1. There was not a significant difference between the average change of anxiety among the conditions,  $F(2,37)=.64$ ,  $p=.53$ . Figure 2 displays the results of this one-way ANOVA.

The data presented in figure 1 suggests there was a different in baseline anxiety before the treatments were given. This might have biased analysis. A one-way ANOVA was conducted to evaluate the baseline level of pre-state anxiety for each condition. Although there was not a significant difference between the average pre-state anxiety among the conditions, there was a trend in this direction, ( $F(2,37)= 1.69$ ,  $p=.19$ ). Figure 3 displays the results of this one-way ANOVA.



### Discussion

Overall, there was a significant decrease in anxiety from pre-condition to post-condition within each condition (see Figure 1). The first analysis was done to see if one condition was more effective than the other in alleviating state anxiety. Results indicated that there was not a significant difference in the effectiveness of each condition. This did not support my hypothesis that yoga would be the most effective condition. However, there was a significant main effect of time, indicating that there were significant decreases in anxiety from pre to post measurement. The results are similar to those of Bahrke and Morgan's (1978) in that we both found significant decreases in anxiety within each condition, but no one condition was more effective than the other.

Another analysis was conducted to further understand the changes in anxiety. Results indicated that the mean change from each condition was not significant from each other. A possible explanation for these results was due to random assignment. Figure 3 displays the average score for each condition. The results show that each condition's pre-condition state anxiety scores were different from each other, with walking being the lowest. Using stratified random assignment would have helped to eliminate the possibility of participants being unequally assigned on the basis of baseline anxiety. We would hope to see participants pre-condition state anxiety relatively close to one another.

A possible reason for yoga not being the most effective is that the type of exercise may not matter. As long as someone is being physically active, they will see decreases in anxiety. To help explain reading's impact, Bahrke and Morgan (1978) explain that using "time out" therapy by reading or sitting quietly may be just as effective as exercise and meditation. "Time out"

therapy is just taking time out of your busy day to do things you enjoy, such as reading, exercising, or meditating.

Something important to note is that the score on the STAI-AD that signifies anxiety (40% of participants were above 40, overall mean of 39.9) among individuals is 39-40 (Julian, 2011). Given these results, the pre-condition average anxiety scores among the walking and yoga condition both had clinically significant symptoms of anxiety. The measurements after the condition both dropped below that cutoff score of 40. Indicated that these treatments were successful in treating anxiety.

With the rise of anxiety throughout the United States, it is important to study ways of alleviating symptoms. The results from this study illustrate that taking just 20 minutes to go for a walk, do yoga, or simply read a book can be an effective way to reduce anxiety.

## References

- Anderson, E., & Shivakumar, G. (2013). Effects of exercise and physical activity on anxiety. *Frontiers in Psychiatry, 4*. doi:10.3389/fpsy.2013.00027
- Bahrke, M. S., & Morgan, W. P. (1978). Anxiety reduction following exercise and meditation. *Cognitive Therapy and Research, 2*(4), 323-333. doi:10.1007/bf01172650
- Carek, P. J., Laibstain, S. E., & Carek, S. M. (2011). Exercise for the Treatment of Depression and Anxiety. *The International Journal of Psychiatry in Medicine, 41*(1), 15–28. doi.org/10.2190/PM.41.1.c
- Caspersen, C. J., Pereira, M. A., & Curran, K. M. (2000). Changes in physical activity patterns in the United States, by sex and cross-sectional age. *Medicine & Science in Sports & Exercise, 32*, 1601-1609. doi:10.1097/00005768-200009000-00013
- Goodwin, R. D. (2003). Association between physical activity and mental disorders among adults in the United States. *Preventive Medicine, 36*(6), 698-703. doi:10.1016/s0091-7435(03)00042-2
- Julian L. J. (2011). Measures of anxiety: State-Trait Anxiety Inventory (STAI), Beck Anxiety Inventory (BAI), and Hospital Anxiety and Depression Scale-Anxiety (HADS-A). *Arthritis care & research, 63 Suppl 11*(0 11), S467–S472. doi:10.1002/acr.20561
- Machado-Vieira, R., Baumann, J., Wheeler-Castillo, C., Latov, D., Henter, I., Salvadore, G., & Zarate, C. (2010). The Timing of Antidepressant Effects: A Comparison of Diverse Pharmacological and Somatic Treatments. *Pharmaceuticals, 3*(1), 19-41. doi:10.3390/ph3010019

- Mishler, A. [Yoga With Adriene] (2013, November 17). *Yoga For Complete Beginners - 20 Minute Home Yoga Workout!* [Video file]. Retrieved from <https://www.youtube.com/watch?v=v7AYKMP6rOE>
- Raja Mahmoud, J. S., Staten, R., Hall, L. A., & Lennie, T. A. (2012). The Relationship among Young Adult College Students' Depression, Anxiety, Stress, Demographics, Life Satisfaction, and Coping Styles. *Issues in Mental Health Nursing*, 33(3), 149-156. doi.org/10.3109/01612840.2011.632708
- Schwarzer, R. (n.d.). Anxiety. Retrieved from <https://macses.ucsf.edu/research/psychosocial/anxiety.php>
- Sheline, Y. I. (2011). Depression and the hippocampus: cause or effect?. *Biological Psychiatry*, 70(4), 308-9. doi: 10.1016/j.biopsych.2011.06.006
- Spielberger, C. D., Gorsuch, R. L., & Lushene, R. E. *Manual for the State-Trait Anxiety Inventory (STAI)*. Palo Alto, California: Consulting Psychologists Press, 1970.
- Wallerblad, A., Möller, J., & Forsell, Y. (2012). Care-Seeking Pattern among Persons with Depression and Anxiety: A Population-Based Study in Sweden. *International Journal of Family Medicine*, 2012, 1-9. doi:10.1155/2012/895425

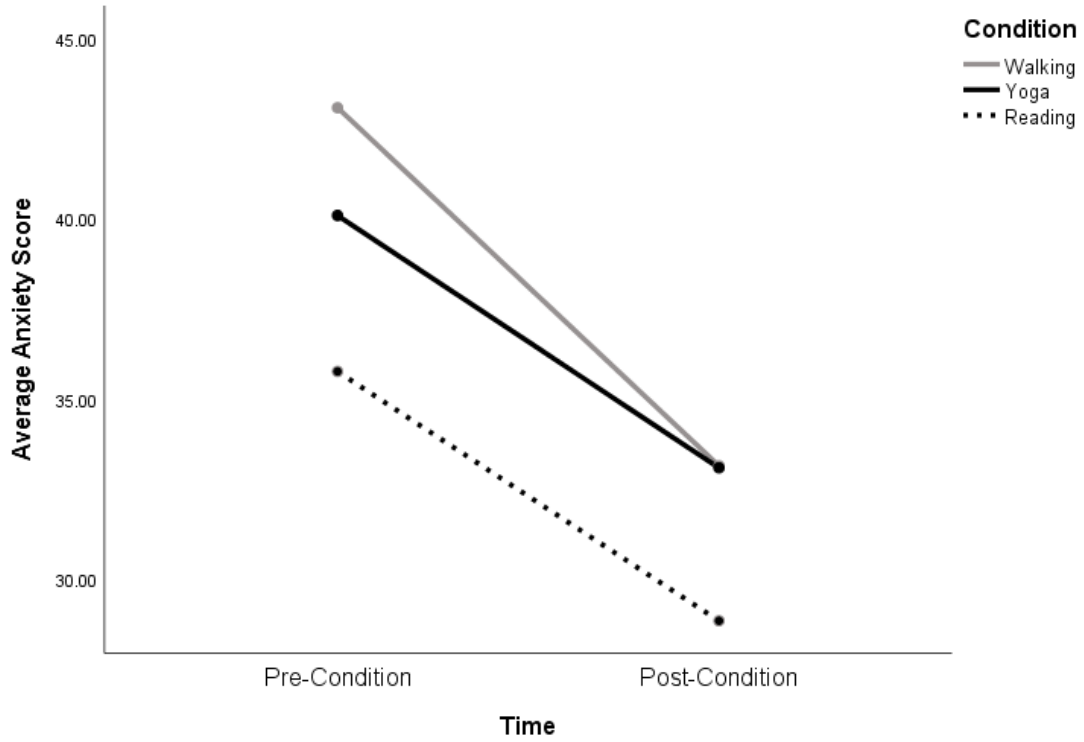


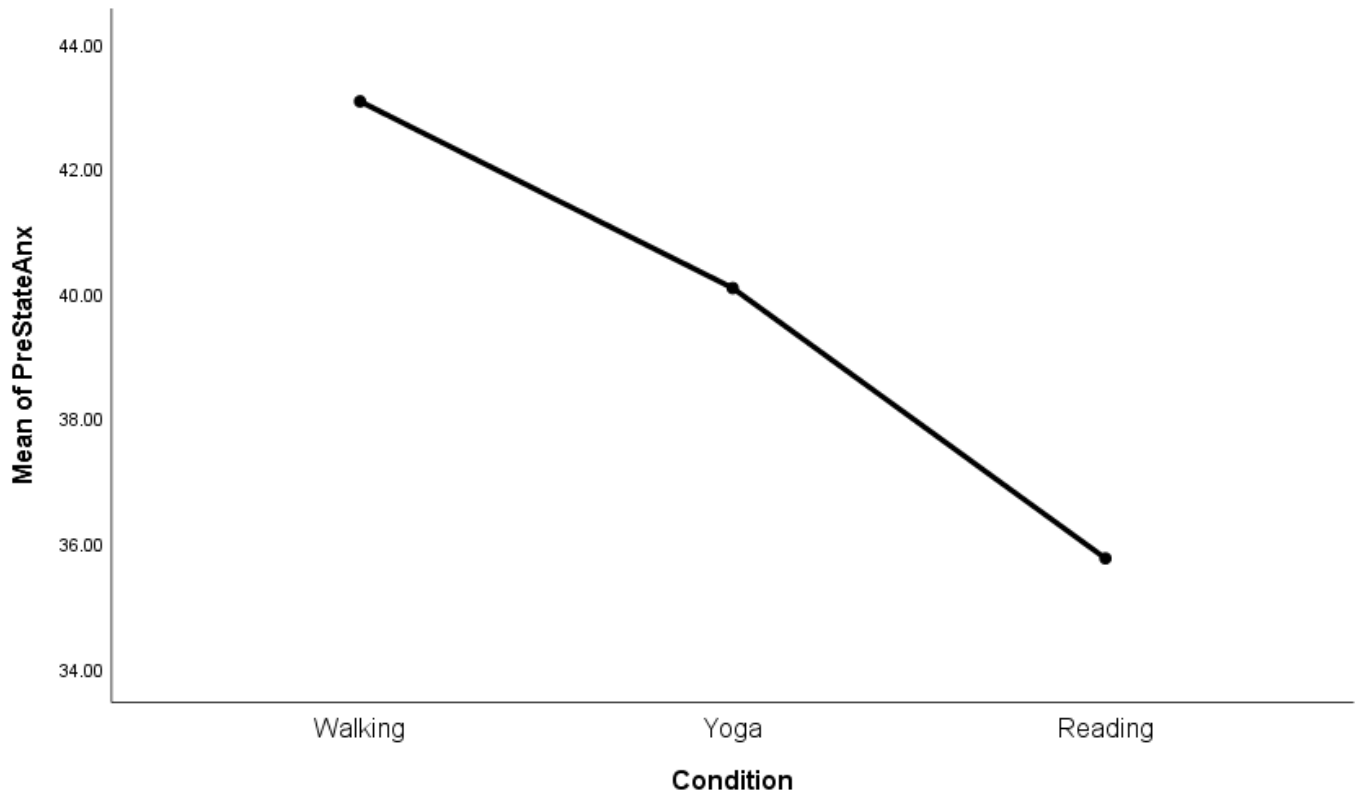
Figure 1. The average anxiety scores as a function of time. Values displayed are  $M$ . Pre-condition to post-condition saw significant decreases, but the difference was not significant between conditions at  $p < .05$ .

Condition			Mean	N	Std. Deviation	Std. Error Mean
Walking	Pair 1	PreStateAnx	43.0667	15	9.53540	2.46203
		PostStateAnx	33.1333	15	4.86778	1.25685
Yoga	Pair 1	PreStateAnx	40.0769	13	13.25683	3.67678
		PostStateAnx	33.0769	13	10.45197	2.89885
Reading	Pair 1	PreStateAnx	35.7500	12	6.99513	2.01932
		PostStateAnx	28.8333	12	3.09936	.89471

*Table 1.* Descriptive statistics for the means for each condition at pre and post condition measurements.



Figure 2. The mean of state anxiety changes as a function of condition. Values displayed are  $M$ .



*Figure 3.* The mean of pre-state anxiety as a function of condition. Values displayed are *M*.



**WINONA STATE UNIVERSITY**  
**UNDERGRADUATE STUDENT RESEARCH & CREATIVE PROJECTS FINAL REPORT**

*Electronically submit complete final report ten (10) days following completion of project to Grants & Sponsored Projects (grants@winona.edu).  
Hover over fill-able fields for additional guideline and completion information.*

Student Name:	<input type="text" value="Theodore Mickelson"/>	Student Email:	<input type="text" value="TMickelson14@winona.edu"/>
Student Major:	<input type="text" value="Psychology"/>		
Faculty Sponsor:	<input type="text" value="Dr. Richard Deyo"/>	Faculty Sponsor Email:	<input type="text" value="rdeyo@winona.edu"/>
Title of Project:	<input type="text" value="Physical Activity and State Anxiety"/>		

**Project Abstract:**

With the rise of anxiety within the United States, it is crucial to find safe and effective ways to alleviate symptoms. The purpose of this study was to examine how walking on a treadmill, participating in yoga, or quietly reading impacts state anxiety. This study included 40 (N=40) students studying psychology at Winona State University. Participants were randomly assigned to one of the three conditions. Participants completed the STAI-AD, an anxiety inventory measuring state and trait anxiety, before and after receiving their assigned condition. Analysis was done using a mixed between-within subjects' analysis of variance to see if one condition was more effective than another in alleviating state anxiety. Results indicated that no condition was more effective in reducing anxiety. Results did indicate that time had a significant main effect. A one-way ANOVA was conducted to compare the mean change of anxiety within each condition. Results indicated there was not a significant change in anxiety between conditions. Another one-way ANOVA was conducted to compare mean pre-condition state anxiety for each condition. The results indicated there was not a significant difference between the treatments pre-condition state anxiety. These findings indicate that anxiety may be reduced by taking 20 minutes to go for a walk, participating in yoga, or reading.

The student-authored final report **MUST** include each of the following (check boxes to verify inclusion of each component):

- This report form, fully completed (page 1 of this form)
- A copy of the project end product, appropriate to the standards of the discipline

Applicant Signature:	<input type="text" value="Theodore Mickelson"/>	Date:	<input type="text" value="5/7/19"/>
Faculty Sponsor Signature:	<input type="text" value="Richard Deyo"/>	Date:	<input type="text" value="5/7/19"/>

Submit complete reports electronically to Grants & Sponsored Projects (grants@winona.edu).

A deans' sub-committee makes decisions on Undergraduate Student Research & Creative Projects proposals.

Note that a copy of the project end product will be forwarded to Krueger Library for archival purposes.