

University of Mississippi

eGrove

---

Honors Theses

Honors College (Sally McDonnell Barksdale  
Honors College)

---

2017

## Comparative Effectiveness of an Exercise and Sedentary Break Intervention on Mood Profile and Dietary Behavior in Young Adults: Pilot Study

Hannah Dau

*University of Mississippi. Sally McDonnell Barksdale Honors College*

Follow this and additional works at: [https://egrove.olemiss.edu/hon\\_thesis](https://egrove.olemiss.edu/hon_thesis)



Part of the [Exercise Science Commons](#)

---

### Recommended Citation

Dau, Hannah, "Comparative Effectiveness of an Exercise and Sedentary Break Intervention on Mood Profile and Dietary Behavior in Young Adults: Pilot Study" (2017). *Honors Theses*. 368.

[https://egrove.olemiss.edu/hon\\_thesis/368](https://egrove.olemiss.edu/hon_thesis/368)

This Undergraduate Thesis is brought to you for free and open access by the Honors College (Sally McDonnell Barksdale Honors College) at eGrove. It has been accepted for inclusion in Honors Theses by an authorized administrator of eGrove. For more information, please contact [egrove@olemiss.edu](mailto:egrove@olemiss.edu).

COMPARATIVE EFFECTIVENESS OF AN EXERCISE AND SEDENTARY BREAK  
INTERVENTION ON MOOD PROFILE AND DIETARY BEHAVIOR IN YOUNG  
ADULTS: PILOT STUDY

By: Hannah Dau

A thesis submitted to the faculty of The University of Mississippi in partial fulfillment of  
the requirements of the Sally McDonnell Barksdale Honors College

Oxford

May 2017

Approved by:

\_\_\_\_\_  
Thesis Advisor: Dr. Paul Loprinzi

\_\_\_\_\_  
Reader: Dr. Toshikazu Ikuta

\_\_\_\_\_  
Reader: Dr. Mark Loftin

© 2017

Hannah Dau

ALL RIGHTS RESERVED

## ACKNOWLEDGEMENTS

I would like to start by thanking my advisor, Dr. Paul Loprinzi, for dedicating so much time and effort toward my success in this research. I also want to thank the entire Exercise Psychology lab for answering my questions, showing support for my endeavors, and generally providing help along the way.

I owe a thank you to the University of Mississippi, the Sally McDonnell Barksdale Honors College, and the Exercise Science department for the opportunity to grow and succeed academically as well as build a foundation for the future.

Lastly, I need to thank my personal support system. Thanks to my parents for inspiring a strong work ethic by always holding me to a high standard and to my friends and family who never failed to ask me how things were coming along. A special thank you as well to those people, friends and strangers, who acted as participants in my study. I'm extremely grateful for your contribution to my work.

## ABSTRACT

HANNAH DAU: Comparative Effectiveness of an Exercise and Sedentary Break Intervention on Mood Profile and Dietary Behavior in Young Adults: Pilot Study  
(Under the direction of Dr. Paul Loprinzi)

Exercise and sedentary behavior are both important subsets of PA (Physical Activity) to study, with emerging research demonstrating that sedentary behavior may predict mental health outcomes independent of PA. Additionally, a correlation has been observed between diet and PA, but few studies on this topic have employed an intervention design. Thus, the purpose of this study was to examine whether changes in PA and sedentary behavior influence mood profile and dietary behavior. The PA intervention consisted of progressively increasing their vigorous-intensity PA (jogging) over a 4-week period among an inactive population. The sedentary group was asked not to exercise, but instead, refrain from prolonged sitting (<45 min at a time). The control group was asked to remain inactive over the 4-week period. The control group showed a significant increase in hostility over time, whereas the two intervention groups did not. Also, improved dietary behaviors were seen in both interventional groups. The sedentary break group, in particular, improved consistently over time, whereas the jogging group improved most from baseline to midpoint. Based on these results, it can be speculated that both participating in vigorous activity and breaking up time spent in sedentary behaviors can positively influence mood profile and dietary behaviors.

## TABLE OF CONTENTS

CHAPTER I: INTRODUCTION.....	1
CHAPTER II: REVIEW OF LITERATURE.....	7
CHAPTER III: METHODS.....	14
CHAPTER IV: RESULTS.....	19
CHAPTER V: DISCUSSION.....	25
CHAPTER VI: CONCLUSION.....	29
LIST OF REFERENCES.....	31

**CHAPTER I**  
**INTRODUCTION**

Research in the area of mental illness in 2013 showed that 18.5% of adults in the U.S. had experienced mental illness within the past year (National Survey on Drug Use and Health 2013). These mental illnesses include anxiety, depression, bipolar disorder, impulse control disorders, etc. This statistic indicates that over 40 million people in this country alone have suffered from such conditions since 2012. These types of disorders are linked to increased cardiovascular disease, respiratory tract disease, and more, and these secondary diseases ultimately lead to shorter life spans in those with severe mental illness (Hert, Marc De, et al. 2011). Additionally, mental illness can also lead to behavioral and motivational complications, such as lethargy seen in those with depression (Corrigan, Druss, & Perlick 2014). In regard to quality of life and even lifespan of these individuals, it is critical to study the ailments they face in order to try and remedy the problems.

Disorders such as depression do not occur only with a diagnosis, though. Some people exhibit the symptomology, but a professional has not clinically diagnosed them. Additionally, an unhealthy mental state does not only occur with the extreme symptomology that constitutes clinical depression. The precursors to these mental illnesses are also important. For example, in a study done by Nabi et al., hostility was a

predictor of depressive mood (Nabi et al. 2010). The authors note that because of this, it is critical to study individual-level psychological factors to more fully understand the predictors of depressive mood. Essentially, if hostility is a precursor to depression or any other mental illness, then it should be studied more extensively to gather as much information as possible.

Most mental illnesses surface by the time a person surpasses adolescence, so it is imperative to study psychological disorders in a young adult population (Kessler et al. 2005). College-aged students and non-students both exhibit high levels of mental illnesses, and the prevalence appears to be continually rising (Eisenberg & Hunt 2010). University students, particularly, are an easily attainable population for a research study because there are copious amounts of them in one contained area. Because of this convenience and the considerable risk of mental illness at this age, college students are frequently involved in studies regarding this topic.

Currently, there are medicinal and therapeutic methods to combat depression and other mental health problems. Medicines that are often used include anti-depressants and anti-psychotics, like chlorpromazine (Shorter & Healy 2013). Psychotherapy is also used in some cases. Importantly, however, mental illness is often undiagnosed, and many college students seem to not perceive a need for help. Even if they do believe they suffer from the symptoms of depression, they often do not receive treatment (Zivin et al.). One web-based study found that between 37%-84% of University students who exhibited signs of mental illness did not have a diagnosis. This large range was caused by differences in disorder; for example, 64% of those who screened positive for depression (without anxiety) were not clinically diagnosed (Eisenberg, Golberstein, & Gollust



2007). Because of the abundance of undiagnosed illnesses, treatment options remain unknown to many college students.

Sometimes, those who perceive a need for help do seek out treatment. However, the options, while effective some of the time, may have side effects. First, many people with mental illness do not respond to the drugs given to them. In fact, in one study, it was seen that fifty percent of patients with depression who were on anti-depressant drugs still exhibited symptoms after being treated several times. Sometimes the symptoms were even more severe than before, like an increased risk of suicide (Hendin et al. 2006). Not only are some treatments ineffective, they can also cause unfavorable side effects, such as weight gain, dry mouth, and sedation. In addition to the questionable effectiveness of these treatment methods and the issue of side effects, cost is a common barrier to accepting help. In particular, when a patient has a severe mental illness, they may be being prescribed drugs as well as attending therapy and possibly even becoming unable to work due to illness (Greenberg, Sisitsky & Kessler 1999). When the cost of the medication, the therapist, and decreased hours at work are added together, there is quite possibly a substantial financial burden on that individual and his or her family.

It would be beneficial to find a cost-efficient method of treatment with few side effects, such as exercise. Even if it was only intended to be used in conjunction with other treatment options such as therapy or medication, something of this nature could decrease some individuals' need for the other treatment options. This could save them money as well as potentially help decrease their need for medication, thus decreasing the risk of unfavorable side effects. If exercise alleviates any or all symptoms of psychological illnesses, it could be implemented as a treatment method and could benefit

patients in various ways. Additionally, for those who do not have a clinical disorder, exercise may potentially show improvement in mood profile independent of a diagnosis. If that is the case, people may desire to add greater amounts of exercise into their routine for not only their physical, but also their emotional wellbeing.

Very few studies have employed a comparative effectiveness design to examine differences in mental health outcomes between moderate to vigorous exercise (MVPA) and interrupted sedentary behaviors. Research demonstrates that extended periods of sedentary behavior, even independent of MVPA, are associated with worse cardiovascular disease outcomes (Loprinzi 2016). This implies that two people with identical amounts of time in sedentary behavior have similar negative disease outcomes, even if one person participates in much more MVPA than the other. These cardiovascular disease outcomes, such as elevated inflammation, as measured by C-reactive protein, are linked with mental health outcomes (Wium-Anderson et al. 2013). To our knowledge, however, no study has evaluated the comparative effectiveness of a MVPA intervention and a sedentary-behavior intervention on mental health outcomes, which was the purpose of the present study.

Not much research has been done on long-term hostility with exercise, but in the present study, we aimed to examine hostility-related mental health over time. With that, we also examined other mental health outcomes such as depression and anxiety, which are more frequently studied.

Additionally, we included the secondary outcome of observing changes in diet in this study to examine if changes in physical activity would foster changes in eating habits. We believe this is possible, as increasing exercise behavior may help to increase

self-efficacy for other health-related behaviors (e.g., diet). Here, within an inactive young adult population, we evaluated the effects of increasing MVPA (intervention arm 1), reducing prolonged sitting, or time in sedentary behavior (intervention arm 2), and a control group on changes in mood profile and changes in dietary behavior.

## **Hypotheses**

### ***Mood Profile***

1) participants in the experimental group who increase their MVPA during a 4-week intervention will have improvements in mood profile.

2) participants in the experimental group who minimize prolonged sedentary behavior will also have improved mood profile, but to a lesser extent than the MVPA group.

3) participants in the control group will not exhibit significant changes in mood profile.

### ***Dietary Behavior***

4) the MVPA intervention group, in particular, will observe improvements in dietary behavior.

5) participants in the control group will not exhibit significant changes in dietary behavior.

## **Definitions/Abbreviations**

**POMS** – Profile of Mood States: used to assess mood profile

**MVPA** – Moderate-Vigorous Physical Activity; 150 minutes per week of MVPA are recommended for health benefits (Knox, Musson, and Adams).

**STC** – Starting the Conversation; a questionnaire used to assess diet choices

**IPAQ (short form)** – International Physical Activity Questionnaire; used to assess physical activity level

**Flavonoid** – nutrient found in fruits and vegetables; high levels of them in diet is associated with increased health.

**PA** – Physical Activity; bodily movements that require energy

**Exercise** – type of physical activity that is planned and typically occurs regularly in order to achieve a certain fitness goal

## **CHAPTER II**

### **REVIEW OF LITERATURE**

A common topic of study in the scientific community is exercise in relation to both physical and mental health. Anger/hostility is one aspect of mood profile that contributes to mental health. Diet is also an interesting component to study in relation to exercise because it is believed that utilizing both healthy eating and exercise is the gateway to having superior physical health. Research of exercise with anger/hostility and exercise with diet are contributors to the understanding of physical activity and its effects on the human body.

#### ***Physical Activity and Mental Health***

In a longitudinal study done in 2013, wellbeing scores were studied in those who participated in various community exercise projects (Malcolm et al. 2013). These projects included, but were not limited to gardening, walking, and gym classes and participants were examined at baseline and a three-month follow-up. These mild to moderate types of exercise fostered a positive change over time in the wellbeing of those who were involved in the study. The participants in this study were not required to be diagnosed with a mental illness, but as stated by Eisenberg et al. (2007), it is important to note that not every person who exhibits symptomology of mental illness has a diagnosis.

With that said, however, these participants would not have had to have a mental illness to find the activities beneficial. Better well-being is a positive mood change for everyone.

Different types of active behavior can elicit change in mood profile (Malcolm et al. 2013) and one study done in 2011 focused solely on yoga as an activity (Yoshihara et al. 2011). Females who had more than two years of yoga experience were compared to females who did not have yoga experience. Those who were well practiced in yoga showed less short and long-term anxiety, fatigue, and anger based on the surveys used in this study. Yoga is not typically seen as a vigorous physical activity, so this study is noteworthy because, like Malcom et al.'s study in 2013, it suggests that active movements in general can play a role in mood profile.

Short increments of ambulatory activity can also be of value to those interested in using movement to improve mental health. In a study done by Jaffery, Edwards, and Loprinzi, a five-minute bout of exercise was examined compared to a control group (2016). It was found that even a five-minute bout of exercise showed reduced mood-related hostility and depression symptomology. Each of the aforementioned studies used different types of physical activity to study changes in mental health. However, all indicate changes in anger or hostility over time participating in physical activity. The implication of this is that several types of movements can be influential for mental health outcomes.

Nabi et al. conducted a study that was related to hostility and depression (2010). They were interested to know if cynical-hostility was a predictor of depression. They found that even over a 19-year span, cynical-hostility is a strong predictor of depressive mood. They believe that the consideration of personality characteristics may be crucial to

understanding depression and the management of it. This brings an increased importance to studying anger and hostility because of the implication it could lead to a more serious ailment with time.

### ***Sedentary Behavior and Mental Health***

Sedentary behavior is another aspect of physical health that is critical to study with mental health outcomes. This is because higher amounts of time in sedentary behavior are linked to higher depression likelihood and severity. In a study done by Hamer, multiple types of sedentary behavior were assessed and it was found that sedentary behavior was correlated with depression (2013). This result is consistent with another study of a Latino population done by Arredondo et al. (2013). In this cross-sectional study, it was found that the more sedentary individuals had a higher chance of having severe depression. This idea is also seen in an article by Loprinzi about cardiovascular disease (2016). In that study, sedentary behavior, regardless of MVPA, was linked to higher levels of cardiovascular disease outcomes, which are also linked to mental health. These studies suggest that sedentary behavior is a crucially important indicator of mental health outcomes.

### ***Physical Activity and Diet***

Physical activity also relates to dietary behavior. The two often coexist because of similar neurocognitive underpinnings. The results of one meta-analysis indicate that improvements in cognitive function, particularly executive functioning, occur with physical activity (Joseph et al. 2011). Importantly, the cognitive processes involved in

executive functioning are also involved with impulse eating behaviors (Colcombe and Kramer 2003). Joseph et al. state that both cognitive testing and neuroimaging studies support this idea that similar executive functions are linked to both eating behaviors and physical activity behaviors (2011).

More work regarding exercise and dietary behaviors has been done by Bryant, King and Blundell. In one study they performed, the findings suggest that exercise is related to a decrease in motivation to eat (2005). Then, in another study with Finlayson as an additional author, the group conducted a second study of similar nature. Their study indicated a relationship between exercise and an increased preference for low-fat foods (Bryant et al. 2006). These findings are related to a study done by Loprinzi in 2016. This study examined the association between accelerometer-based physical activity and flavonoid rich fruits and vegetables (Loprinzi 2015). The findings indicated that adults engaging in more MVPA generally consumed more flavonoid rich fruits and vegetables, which have been seen to be associated with increased health. Increased exercise seems to be consistently related to improved eating behaviors, and this could be due to the similar neurocognitive underpinnings noted by Joseph et al. (2011). These studies indicate that those who participate in more physical activity naturally gravitate towards healthier diet options.

### ***Sedentary Behavior and Diet***

Like physical activity, sedentary behavior has a relationship with diet. A systematic review paper examined the associations between the two in an adult population. Higher levels of sedentary behavior were seen to be associated with high



calorie snack consumption, high calorie drink consumption, and fast-food consumption. After reviewing multiple studies regarding this, it was determined in this paper that sedentary behavior is associated with a less healthy diet. As stated elsewhere, “interventions need to be developed that target reductions in sedentary time to test whether diet also changes,” according to the authors (Pearson & Biddle 2011). This is precisely what the present study aimed to do when examining the sedentary behavior break group and dietary changes.

### ***Mood and Diet***

Both mood and diet seem to be related to physical activity choices. Not only does physical activity influence mood and depression, but according to some research, diet appears to mediate the two (Stunkard, Faith, & Allison 2003; Markowitz, Friedman, & Arent 2008). Research even suggests that mood and diet may be interrelated even independent of physical activity. More specifically, unfavorable mood profile appears to be correlated with worse dietary behavior. In one cross sectional study, healthy eating index scores were compared to symptoms of depression in those with type II diabetes (Exebio et al. 2011). For this population, symptoms of depression changed based on diabetes status and gender. However, these changes were only seen in those with a lower quality diet. This indicates that diabetes status and gender may play an additive role in depressive symptoms, but a higher quality diet may have a preventative effect on this.

Another recent study conducted was related to adherence to healthy eating guidelines. The relationship seen between adherence to the guidelines and anxiety and depression was inverse. In other words, as adherence to healthy eating behaviors

improved and risk of anxiety and depression decreased (Saneei 2016). This means that the reverse is true as well. If participants did not participate in healthy eating behaviors, they had an increased risk of anxiety and depression, which is similar to the results of Exebio et al. (2011).

Lastly, in a study done by Loprinzi and Mahoney, the dose-response relationship of lifestyle behaviors and depression was studied (2014). These lifestyle factors included things such as diet, physical activity, and smoking. Participants were examined based on whether they engaged in 0-3 positive lifestyle behaviors, and with each added behavior, the participants were less likely to exhibit moderate or greater depression symptoms. Specifically, those participants engaging in 3 positive lifestyle factors were 82% less likely to have moderate-severe depression symptoms. Though the results showed that with each additional positive lifestyle factor, the risk of depression and anxiety decreased, it is noteworthy that even one positive change showed a lower risk. This indicates that for those who find it daunting to change multiple behaviors at one time, even changing one can decrease the risk of mental health disorders.

Prior research has been done regarding the interrelationships between exercise, mood profile, sedentary behavior, and diet. The present study aimed to examine all of these in addition to sedentary behavior breaks. These breaks would occur once every 45 minutes during prolonged inactivity. This way, the participants would limit the amount of time they spent in uninterrupted sedentary behavior. All of the participants began the study as self-reported inactive, but were placed in randomized groups at the beginning of the intervention to determine their level of activity for the following four weeks. Dietary behaviors and mood profile were examined in all three groups: MVPA jogging, sedentary

behavior break, and control. This way, individual changes could be inspected, i.e. between jogging and diet, sedentary breaks and diet, jogging and mood profile, and sedentary breaks and mood profile.

Many of the studies previously completed employed an observational approach rather than an interventional design. In the current study, an experimental design was utilized to observe the changes over time when a modified behavior was implemented. This is useful because an observational study shows correlations at one time point only whereas an interventional study examines the outcomes of a specific, measured change. In particular, much of the research on sedentary behavior included cross-sectional comparisons of multiple groups engaging in differing amounts of inactivity. By using this approach, correlations are seen between dietary behaviors and mood profile for both sedentary and active individuals. Then, the results from each group can be compared. The results of studies such as this are useful, but for the present study we wanted to examine the potential change in each individual participant as he or she implemented the sedentary behavior breaks.

## **CHAPTER III**

### **METHODS**

#### **Study Design and Participants**

A three-arm parallel group randomized control intervention was employed. Participants were randomized into one of three groups: 1) jogging intervention (N=10); 2) sedentary break intervention (N=10); and 3) control group (N=9).

The recruitment process for the study included using a convenience sampling approach at the authors' university. In order to partake in the study, participants needed to fit the following criteria. They were required to be in the age range of 18-35, considered "ready" to participate in physical activity as determined by the Physical Activity Readiness Questionnaire, able to speak English, and able to provide written consent. Further, as determined by the International Physical Activity Questionnaire, participants were only eligible for inclusion in this study if they self-reported engagement in < 75 minutes/week of vigorous physical activity. This specific "inactive" threshold was determined as this is half of the current government guidelines (150 min/week) for MVPA. They would be excluded from the study if they did not meet any of the above conditions, had a clinical diagnosis of depression or an anxiety/panic disorder, or had an existing illness at the time of the study. The study was approved by the authors' institutional review board.

### *Intervention Groups*

The intervention lasted 4 weeks, with assessments occurring at baseline, mid-point (2-weeks) and immediately post-intervention (4-week period).

For the jogging intervention group, participants were instructed to gradually increase their jogging to 75 minutes per week by week 4, with their jogging to occur on their own in an environment of their choosing. This was done by starting off with a 10 minute jog twice a week the first week, to a 10 minute jog three times a week the second week and so forth.

Unlike the jogging group, the sedentary break intervention group was not instructed to increase their MVPA, but instead, were instructed to minimize prolonged sitting during the 4-week intervention period. Every 45 minutes during the day, they were instructed to get up and walk briefly for a few minutes. At the mid-point and post-intervention assessments, they were asked the following 4 questions:

- 1) Implementing the sedentary break intervention (every 45 minutes) was relatively easy to do over the past two weeks.
- 2) Implementing the sedentary break intervention (every 45 minutes) was relatively easy to maintain over the past two weeks.
- 3) Implementing the sedentary break intervention (every 45 minutes) did not negatively affect my ability to accomplish my normal activities over the past two weeks.
- 4) Over the course of the past two weeks, the intervention did not negatively influence my ability to engage in social interactions.

For these 4 questions, responses options ranged from 1-7, in the order of strongly disagree, disagree, somewhat disagree, neutral, somewhat agree, agree, and strongly agree.

Those in the control group were simply asked to maintain their current lifestyles during the 4-week intervention period.

### ***Measurement of Mood Profile***

Identical to a previous study (Loprinzi & Kane 2015), the Profile of Moods States (POMS) questionnaire was used to evaluate mood profile. The *depression-dejection* (13 items) and *anger-hostility* (11 items) subscales were focused on for the present study.

The POMS survey has demonstrated adequate levels of internal consistency ( $\alpha = .779-.926$ ) (Curran, Andrykowski & Studts 1995) as well as criterion validity (Yokoyama 1990) and construct validity (Kaye et al. 1988). In the present study, internal consistency, as measured by Cronbach's alpha, was 0.94, 0.87 and 0.88, respectively, for *depression-dejection* for the MVPA, sedentary break and control groups at baseline. For these respective groups for anger/hostility, Cronbach's alpha at baseline was 0.81, 0.81, and 0.81.

### **Measurement of Dietary Behavior**

Participants also completed an 8 item *Starting the Conversation* (STC) dietary questionnaire, which assesses food patterns (nutrient or fat intake) and has been used as a tailored approach for dietary counseling. An example item is, "In the past week, how many times did you eat fast food meals or snacks?" For each of the 8 items, there are

three response options, which varies based on the item. As an example, response options included “< 1 time, 1-3 times and 4+” for “How many times a week did you eat fast food meals or snacks?” For the item, “How many servings of fruits did you eat each day?” response options included, “5+, 3-4, or 2 or less.” Ultimately, the summed dietary score ranged from 8-24, with higher scores reflecting a greater dietary behavior. Some items were reverse coded to reflect this, i.e. eating 5+ servings of fruits and vegetables constituted the same numerical score as eating fast food or snacks <1 time. The STC has demonstrated evidence of feasibility, validity and sensitivity to change (Paxton et al. 2011).

### **Measurement of Physical Activity**

At each of the 3-time points, physical activity was self-reported using the International Physical Activity Questionnaire (IPAQ)-short form. The IPAQ form asked participants about the time they spent being physically active in the last seven days. For example, questions on the form include “How many days did you participate in vigorous physical activity over the last seven days?” followed by “How much time did you usually spend on one of those days doing vigorous physical activities?” Participants can report their answers in hours per day or minutes per day. Previous research shows the IPAQ to demonstrate some evidence of being reliable and valid (Craig, Marshall, & Sjostrom 2003).

### **Statistical Analyses**

All analyses will be computed in SPSS (v. 12). To examine the effects of the different interventions on the outcome parameters, a repeated measures 3 (group) x 3

(time) ANOVA was employed. Condition (3-arm intervention groups) served as the between-subject variable and time (baseline, mid-point and post-intervention) served as the within-subject variable. Statistical significance was established as  $P < 0.05$ .



## **CHAPTER IV**

### **RESULTS**

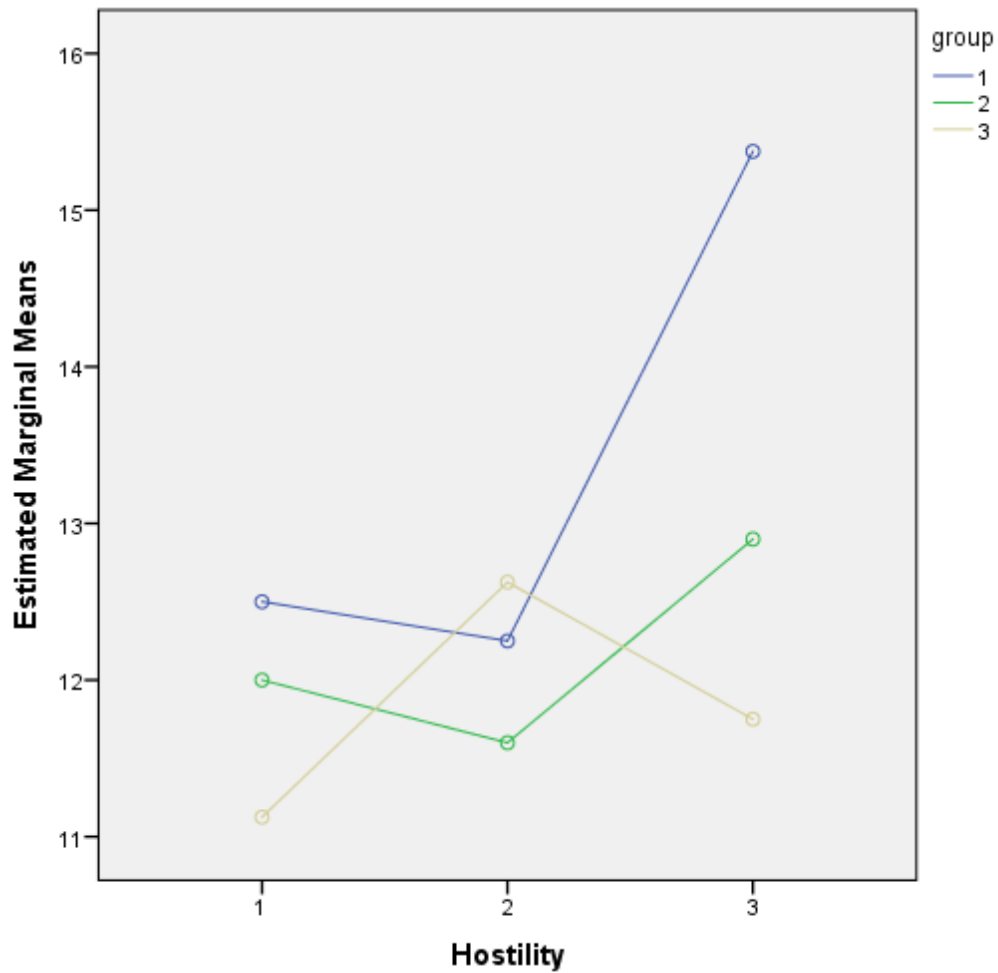
The mean age of the sample was 21.3 years (SE=0.5); 75.8% were female; and 69% were non-Hispanic white. Mood profile and dietary behavior scores, across the 3 groups and 3 time points, are shown in Table 1.

With regard to the main findings, the 3 x 3 repeated measures ANOVA was significant for anger/hostility ( $F=3.48$ ,  $P=0.04$ , partial-eta squared=0.23) but not depression/dejection ( $F=0.19$ ,  $P=0.94$ , partial-eta squared=0.01). For anger/hostility, and as shown in Figure 1, the jogging group, compared to the sedentary break or control groups, had an attenuated increase in anger/hostility over the 4-week intervention.

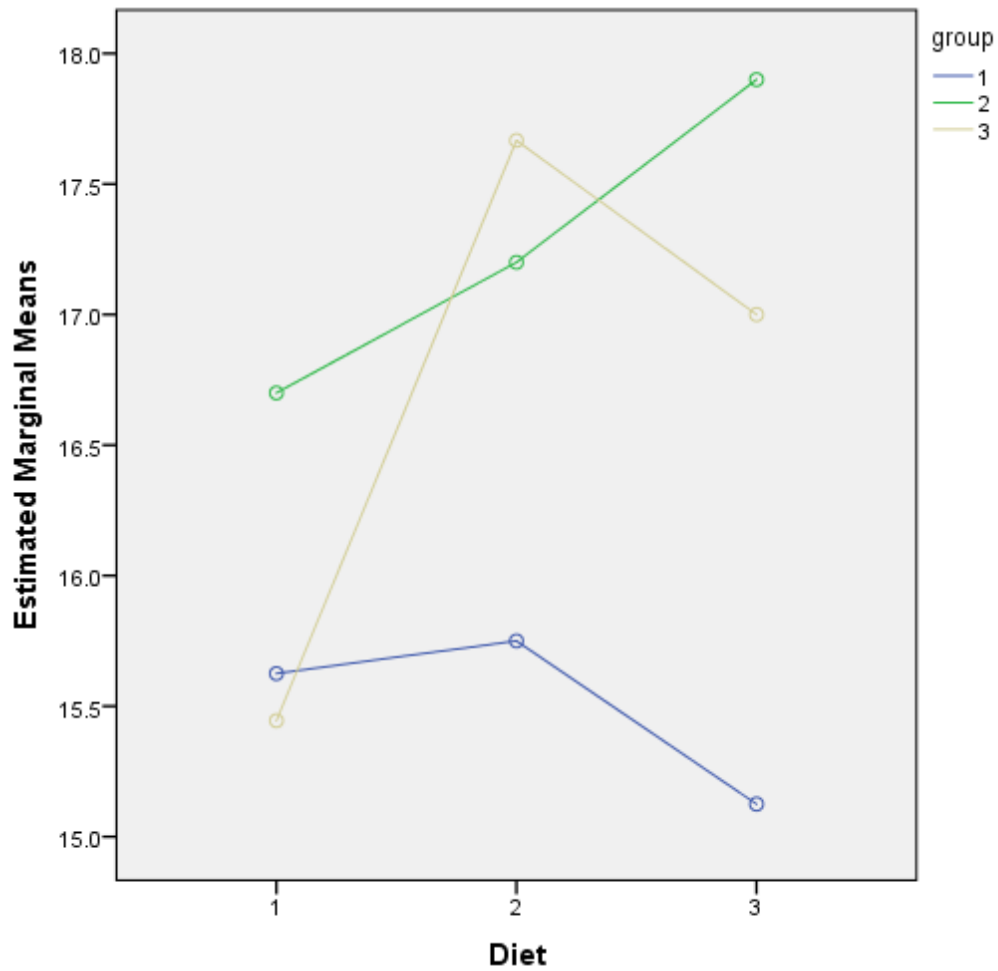
The 3 x 3 repeated measures ANOVA was significant for dietary behavior ( $F=3.44$ ;  $P=0.04$ ; partial eta-squared=0.22). As shown in Figure 2, the jogging group and the sedentary break groups, compared to the control group, had an increase (better) in dietary behavior over the 4-week intervention.

Table 1. Changes (mean (SE)) in the study variables across the intervention periods.

	<b>Baseline</b>	<b>Mid- Intervention</b>	<b>Post- Intervention</b>
<b>Vigorous-Intensity Activity (min/week)</b>			
Control Group	10.0 (7.0)	26.25 (22.2)	37.5 (25.1)
Sedentary Break Intervention	12.0 (7.0)	46.0 (27.9)	52.5 (30.5)
Jogging Intervention	8.0 (6.1)	28.9 (3.2)	95.5 (28.4)
<b>POMS-Depression</b>			
Control Group	16.4 (2.1)	16.6 (1.9)	16.6 (2.3)
Sedentary Break Intervention	16.6 (1.5)	15.9 (1.1)	16.2 (1.9)
Jogging Intervention	14.5 (0.8)	14.0 (0.3)	13.7 (0.3)
<b>POMS-Hostility</b>			
Control Group	12.3 (0.7)	12.2 (0.4)	15.3 (2.6)
Sedentary Break Intervention	12.0 (0.5)	11.6 (0.3)	12.9 (1.1)
Jogging Intervention	11.3 (0.1)	12.6 (0.8)	11.8 (0.4)
<b>Dietary Behavior</b>			
Control Group	16.0 (0.7)	16.2 (0.6)	15.1 (0.9)
Sedentary Break Intervention	16.7 (0.8)	17.2 (0.8)	17.9 (0.4)
Jogging Intervention	15.4 (1.2)	17.3 (0.7)	17.0 (0.6)



**Figure 1. Mean changes in POMS-hostility scores for the 3 groups across the 3 time points (1=Control, 2=Sedentary Break Group, 3=Jogging Group). Time points 1, 2, and 3, respectively, represent pre-intervention, mid-intervention, and post-intervention.**



**Figure 2. Mean changes in dietary behavior scores (higher is better) for the 3 groups across the 3 time points (1=Control, 2= Sedentary Break Group, 3=Jogging Group). Time points 1, 2, and 3, respectively, represent pre-intervention, mid-intervention, and post-intervention.**

With regard to the qualitative questions for the sedentary break intervention, results are as follows:

- 1) Implementing the sedentary break intervention (every 45 minutes) was relatively easy to do over the past two weeks.

Mid-Intervention: Mean (SE)=5.77 (0.40); 5.7 equates to between “somewhat agree” and “agree”.

Post-Intervention: Mean (SE)=5.77 (0.54); 5.7 equates to between “somewhat agree” and “agree”.

- 2) Implementing the sedentary break intervention (every 45 minutes) was relatively easy to maintain over the past two weeks.

Mid-Intervention: Mean (SE)=4.22 (0.61); 4.2 equates to between “neutral” and “somewhat agree”.

Post-Intervention: Mean (SE)=5.77 (0.54); 4.88 equates to between “neutral” and “somewhat agree”.

- 3) Implementing the sedentary break intervention (every 45 minutes) did not negatively affect my ability to accomplish my normal activities over the past two weeks.

Mid-Intervention: Mean (SE)=6.22 (0.32); 6.2 equates to between “agree” and “strongly agree”.

Post-Intervention: Mean (SE)=6.33 (0.16); 6.3 equates to between “agree” and “strongly agree”.

- 4) Over the course of the past two weeks, the intervention did not negatively influence my ability to engage in social interactions.

Mid-Intervention: Mean (SE)=6.44 (0.24); 6.4 equates to between “agree” and “strongly agree”.

Post-Intervention: Mean (SE)=6.33 (0.17); 6.3 equates to between “agree” and “strongly agree”.

## **CHAPTER V**

### **DISCUSSION**

The purpose of this study was to compare the effectiveness of a MVPA intervention and a sedentary-behavior break intervention on mental health and other health outcomes. As far as we know, a study of this kind had not been completed prior, so the study's purpose originated from that gap in the literature. We hypothesized that participants in both the MVPA and sedentary behavior break intervention groups would have an improved mood profile, with the MVPA group exhibiting a larger degree of change. Additionally, we hypothesized that participants in the control group would not exhibit significant changes in mood profile. As for our secondary outcome of interest during this study, we hypothesized that dietary behavior improvements would be seen in the MVPA group. The findings of this study did, in fact, indicate a change in mood profile in both intervention groups as compared to the sedentary control group. Also, changes in dietary behavior were seen in the two experimental groups.

In regard to mental health, the focus of the hypothesis was primarily on depression and hostility. However, this study did not indicate changes in depression. We speculate that this could be because a clinically diagnosed population was not used. If the participants would have been diagnosed with depression, it is possible that significant changes in this parameter may have been more likely to be observable (due to a greater room for change). However, though mood profile did not change as far as depression,

our results did indicate that both the jogging and sedentary behavior break groups had a favorable change in anger/hostility as compared to the control group.

In addition to changes to mood profile, positive changes in dietary behavior were also seen. Both the jogging and sedentary behavior break groups showed improvement in dietary behaviors compared to the control group. In fact, the sedentary behavior break group improved more consistently throughout the intervention than the jogging group. The sedentary behavior break group showed a linear relationship with dietary behaviors, as seen in Figure 2. Though the jogging group improved to a higher degree from the first visit to the last visit, their average scores at the midpoint were higher than scores at the end. We speculate that this may have been a result of a compensatory effect. Because participants in the jogging group felt “healthier” after jogging regularly for two weeks, they may have thought (either subconsciously or consciously) it was okay to eat something unhealthy as long as they were being active. It could have potentially also been due to the transition from being sedentary to being active. During the first weeks, they could have been hyper conscious of their eating behaviors in an attempt to engage in multiple healthy behaviors, but by the third and fourth weeks they may have regressed more closely to their typical eating patterns. The link between eating behavior and exercise behavior is critical in the study of health. As stated by Joseph et al. (2011), similar executive functions influence both eating habits and exercise. These neurocognitive underpinnings may help to explain the improved dietary behavior seen in the present study in the sedentary behavior break group, and especially in the jogging group.



This connection between diet and exercise can be extremely important for health interventions. This is because, though it seems to be necessary to change both in order to maximize health, it can be difficult to implement a multi-behavior intervention to change both at the same time. The implication that exercise and diet have similar neurocognitive underpinnings suggests that an exercise program alone may help to naturally promote healthier diet behaviors. Then, after the exercise behavior is established, more effort can be applied to the dietary behaviors, which may not be as difficult because changes in that behavior have already begun.

Some people may also not want to implement an exercise program, but want to try to improve certain health outcomes. Based on this study, as well as others, it is plausible that shorter periods in sedentary behavior can aid in that. This gives another option aside from exercise that can promote not only a more emotionally healthy mood profile, but also improved dietary behaviors.

Another point of interest for this research is the qualitative analysis of the interventions. Four questions were used to assess the difficulty of implementation of the sedentary break intervention. The questions inquired about how much effort it took to implement the sedentary break intervention during the past two weeks, and the set of questions was asked at both the midpoint and end of the intervention. This was done to see the change in difficulty over time. Because a mean score between “neutral” and “somewhat agree” was the most unfavorable answer to the four questions throughout the four weeks, the qualitative analysis suggests that this type of intervention is feasible. As research in this domain continues in the future, it is encouraging to see that a sedentary behavior break intervention may be reasonable to implement into everyday life.

There are a few main strengths of this study, but also some limitations, as expected. One strength is the study's novelty. Because a study like this has not been conducted previously, this information is new and can encourage more similar, yet larger-scale studies in the future. Another strength is that this was interventional study, as opposed to a cross-sectional design. Additionally, this study looked at multiple outcomes, i.e. hostility, depression, and dietary behaviors. Perhaps a critical strength of this study was the use of a specifically inactive population. In some studies on this topic, physical activity level is not part of the eligibility criteria. However, the results of the present study may be particularly applicable to the general public because often those who desire to change their exercise behaviors are, in fact, inactive. A limitation of this study is the use of self-report measures of physical activity and dietary behavior. The other limitations of this study are mostly regarding the participant pool. This pilot study employed a small sample size, and the participants were primarily non-Hispanic white and female. Additionally, the population for this study was very specific in that it was young adults pursuing an undergraduate or graduate education. However, because of the high prevalence of psychological problems in people of this age, it is important to study them. This population is not only highly prone to mental illnesses such as depression, but also stress and unhealthy eating.

In conclusion, in our pilot experimental study, we demonstrated some evidence to suggest that changes in higher-intensity exercise (e.g., jogging) and minimizing prolonged sedentary behavior may help to improve mood profile and dietary behavior. Future replicative work is needed to confirm our pilot findings.

## **CHAPTER VI**

### **CONCLUSION**

#### ***Findings***

The present study aimed to examine the differences in mood profile and dietary behaviors in both jogging and sedentary break intervention groups. The findings indicate a more positive mood profile in those who avoided prolonged sitting and even more so in those who participated in the jogging intervention. Additionally, the findings regarding diet indicate that an increased amount of movement, whether through sedentary breaks or structured exercise, can influence improved eating habits. The sedentary behavior break intervention seems to be feasible based on responses to qualitative questions given to the participants of this study; this is promising for the implementation of such an intervention to the public. These findings give information regarding the relationships between each of these outcomes that can be utilized by other researchers and potentially the general public. Knowledge of the connection between physical activity and both mood profile and diet can help those who wish to gain better mental and physical health. Similarly, knowledge that decreasing prolonged periods of sedentary behavior also positively affects mood profile and diet can be useful for those who cannot or do not wish to participate in regular physical activity.

### ***Future Research***

In future research on this topic, interventional research methods should continue to be utilized. Expanding on the population studied would be important because though this population was influenced by our intervention, it is important to determine whether there is generalizability to other populations. Additionally, this study was a four-week long intervention, but studies in the future could last longer as the present pilot study used a relatively short period for changing physical activity behaviors.

## REFERENCES

- Arredondo, E. M., Lemus, H., Elder, J. P., Molina, M., Martinez, S., Sumek, Caryn., Ayala, G. X. (2013). The relationship between sedentary behavior and depression among Latinos. *Mental health and physical activity*. Vol 6(1), pp 3-9.
- Bryant E, Finlayson G, King N, Blundell J. The influence of acute exercise on linking and preferences for food on high trait disinhibition women. *Obes Rev*. 2006;17:343.
- Bryant E, King N, Blundell J. Effect of exercise on appetite control in women with high trait disinhibition. *Appetite*. 2005;45:363.
- Colcombe S, Kramer AF. Fitness effects on the cognitive function of older adults: a meta-analytic study. *Psychological science*. Mar 2003;14(2):125-130.
- Corrigan, Patrick W., Benjamin D. Druss, and Deborah A. Perlick. "The Impact of Mental Illness Stigma on Seeking and Participating in Mental Health Care." Association for Psychological Science RSS. Association for Psychological Science, 1 Aug. 2014. Web. 23 Nov. 2015.
- Covell, N.H., Weissman, E.M., Schell, B. et al. *Adm Policy Ment Health* (2007) 34: 435. doi:10.1007/s10488-007-0131-1.
- Craig CL, Marshall AL, Sjostrom M, et al. International physical activity questionnaire: 12-country reliability and validity. *Medicine and science in sports and exercise*. Aug 2003;35(8):1381-1395.
- Curran SL, ANdrykowski, M. A., Studts, J. L. Short form of the Profile of Mood States

- (POMS-SF): Psychometric information. *Psychological Assessment*. 1995;7(1):80-83.
- Eisenberg D, Golberstein E, Gollust SE. Help-seeking and access to mental health care in a university student population. *Medical care*. Jul 2007;45(7):594-601.
- Exebio JC, Zarini GG, Exebio C, Huffman FG. Healthy Eating Index scores associated with symptoms of depression in Cuban-Americans with and without type 2 diabetes: a cross sectional study. *Nutrition journal*. Dec 09 2011;10:135.
- Greenberg PE, Sisitsky T, Kessler RC, et al. The economic burden of anxiety disorders in the 1990s. *The Journal of clinical psychiatry*. Jul 1999;60(7):427-435.
- Hamer, M, M. (2016). Prospective study of sedentary behavior, risk of depression, and cognitive impairment. *Medicine and science in sports and exercise*, Vol. 46(4), 718-723.
- Hendin H, Haas AP, Maltzberger JT, Koestner B, Szanto K. Problems in psychotherapy with suicidal patients. *The American journal of psychiatry*. Jan 2006;163(1):67-72.
- Hert, Marc De, et al. "Physical Illness in Patients with Severe Mental Disorders. I. Prevalence, Impact of Medications and Disparities in Health Care." *World Psychiatry*. Elsevier Italy, Feb. 2011. Web. 23 Nov. 2015.
- Hunt, J. and Eisenberg, D. Mental Health Problems and Help-Seeking Behavior Among College Students. *Journal of Adolescent Health* Vol. 46, Issue 1. (2010), pp. 3-10.
- Jaffery A, Edwards MK, Loprinzi PD. Randomized Control Intervention Evaluating the

- Effects of Acute Exercise on Depression and Mood Profile: Solomon  
Experimental Design. *Mayo Clinic proceedings*. Mar 2017;92(3):480-481.
- Joseph, R. Alonso-Alonso, M. Bond, D. Pascual-Leone, A. Blackburn, L. The  
Neurocognitive Connection between Physical Activity and Eating Behavior. US  
National Library of Medicine. 2011.
- Kaye JM, Lawton, M. P., Gitlin, L. N., Kleban, M. H., Windsor, L. A., Kaye, D. Older  
people's performance on the Profile of Mood States (POMS). *Clinical  
Gerontologist*. 1988;7:35-56.
- Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, Walters EE. Lifetime  
prevalence and age-of-onset distributions of DSM-IV disorders in the National  
Comorbidity Survey Replication. *Archives of general psychiatry*. 2005;62(6):593-  
602.
- Knox EC, Musson H, Adams EJ. Knowledge of physical activity recommendations in  
adults employed in England: associations with individual and workplace-related  
predictors. *The international journal of behavioral nutrition and physical activity*.  
May 23 2015;12:69.
- Loprinzi, PD. Association between accelerometer-determined physical activity and  
flavonoid-rich fruit and vegetable consumption among a national sample of U.S.  
adults. *Prev Med Rep*. 2016 Jun; 3: 58–61. Published online 2015 Dec 11. doi:  
10.1016/j.pmedr.2015.12.001
- Loprinzi PD. Sedentary behavior and predicted 10-yr risk for a first atherosclerotic  
cardiovascular disease (ASCVD) event using the pooled cohort risk equations  
among US adults. *International journal of cardiology*. Jan 15 2016;203:443-444.

- Loprinzi PD, Kane CJ. Exercise and cognitive function: a randomized controlled trial examining acute exercise and free-living physical activity and sedentary effects. *Mayo Clinic proceedings*. Apr 2015;90(4):450-460.
- Loprinzi PD, Mahoney S. Concurrent occurrence of multiple positive lifestyle behaviors and depression among adults in the United States. *Journal of affective disorders*. Aug 2014;165:126-130.
- Malcolm E, Evans-Lacko S, Little K, Henderson C, Thornicroft G. The impact of exercise projects to promote mental wellbeing. *Journal of mental health*. Dec 2013;22(6):519-527
- Markowitz S, Friedman MA, Arent SM. Understanding the relation between obesity and depression: causal mechanisms and implications for treatment. *Clin Psychol Sci Pract*. 2008;15:1–20
- Nabi H, Singh-Manoux A, Ferrie JE, Marmot MG, Melchior M, Kivimaki M. Hostility and depressive mood: results from the Whitehall II prospective cohort study. *Psychological medicine*. Mar 2010;40(3):405-413.
- Paxton AE, Strycker LA, Toobert DJ, Ammerman AS, Glasgow RE. Starting the conversation performance of a brief dietary assessment and intervention tool for health professionals. *American journal of preventive medicine*. Jan 2011;40(1):67-71.
- Pearson N, Biddle SJ. Sedentary behavior and dietary intake in children, adolescents,



- and adults. A systematic review. *American journal of preventive medicine*. Aug 2011;41(2):178-188.
- Saneei P, Hajishafiee M, Keshteli AH, Afshar H, Esmailzadeh A, Adibi P. Adherence to Alternative Healthy Eating Index in relation to depression and anxiety in Iranian adults. *The British journal of nutrition*. Jul 2016;116(2):335-342.
- Shorter, E. and Healy, D. Shock Therapy: A History of Electroconvulsive Treatment in Mental Illness. New Brunswick: Rutgers UP, 2013. Pp. 4-5 Web. November 2016.
- Stunkard AJ, Faith MS, Allison KC. Depression and obesity. *Biological psychiatry*. Aug 01 2003;54(3):330-337.
- Substance Abuse and Mental Health Services Administration, Results from the 2013 National Survey on Drug Use and Health: Mental Health Findings, NSDUH Series H-49, HHS Publication No. (SMA) 14-4887. Rockville, MD: Substance Abuse and Mental Health Services Administration, 2014.
- Wium-Andersen MK, Orsted DD, Nielsen SF, Nordestgaard BG. Elevated C-reactive protein levels, psychological distress, and depression in 73, 131 individuals. *JAMA psychiatry*. Feb 2013;70(2):176-184.
- Yokoyama K, Araki S, Kawakami N, Tkakeshita T. [Production of the Japanese edition of profile of mood states (POMS): assessment of reliability and validity]. [*Nihon koshu eisei zasshi*] *Japanese journal of public health*. Nov 1990;37(11):913-918.
- Yoshihara K, Hiramoto T, Sudo N, Kubo C. Profile of mood states and stress-related

biochemical indices in long-term yoga practitioners. *BioPsychoSocial medicine*.

Jun 03 2011;5(1):6.

Zivin K, Eisenberg D, Gollust SE, Golberstein E. Persistence of mental health problems

and needs in a college student population. *Journal of affective disorders*. Oct

2009;117(3):180-185.