

THE IMPACT OF EXERCISE INVOLVEMENT ON COLLEGE STUDENT
PERCEIVED STRESS AND ACADEMIC PERFORMANCE

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ABSTRACT

Using archival data from a longitudinal study conducted at a university in the southwest region of the United States, this study used a variety of analyses to examine the relationship between physical activity and perceived stress, physical activity and perceived academic performance, and physical activity and work-study interference. Participants were freshman from the psychology research pool of a large, public university. Several measures were used to track self-reports of physical activity, perceived stress, perceived academic performance, and work-study interference. Results were significant for physical activity and perceived stress, indicating that participants who engaged in regular physical activity each week had significantly lower levels of stress than those who did not. Hypotheses regarding perceived academic performance and work-study interference were not supported. Limitations of the study and potential implications of the results are discussed.

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CHAPTER I: INTRODUCTION & LITERATURE REVIEW

The positive impact of physical activity on mental and physical health has been documented throughout the years (Anshel, Brinhaupt, & Kang, 2010; Blaber, 2005; Tyson, Wilson, Crone, Brailsford, & Laws, 2010). Physical activity, or “bodily movement produced by skeletal muscles that results in energy expenditure” (Caspersen, Powell, & Christenson, 1985, p. 126), has been shown to decrease perceived stress and anxiety, improve overall mental well-being, and reduce diseases and illnesses that lead to premature death (American Institute for Cancer Research and World Cancer Research Fund, 2007; Brown, Gilson, Burton, & Brown, 2011; Warburton, Nicol, & Bredin, 2006). This topic has been investigated in a variety of occupations, including nurses, undergraduate university students, and corporate employees, with each revealing the unequivocal positive benefits of physical activity (Blaber, 2005; Tyson et al., 2010).

With an array of positive benefits derived from physical activity, reducing the relative decline in physical activity throughout a person’s lifetime is inherently beneficial. In the workplace, organizations often implement wellness programs, exercise plans, and other interventions designed to counteract a decline in physical activity. Research has found that these wellness programs can decrease the costs associated with healthcare and disability benefits, improve aspects of work performance, and decrease absenteeism, all of which make them advantageous for companies to implement (Milano, 2007; Pronk et al., 2004; Scotton, 2011). These programs have not only demonstrated their effectiveness in the corporate world, but also in student populations. Wellness intervention techniques have been shown to increase perceived academic performance and decrease the level of

depression among adolescent students (Field, Diego, & Sanders, 2001; Hollar et al., 2010). Similarly, research has shown anxiety and depression to be negatively correlated with increased physical activity in undergraduate college students (Tyson et al., 2010).

With the extensive list of benefits derived from physical activity, it is no wonder that organizations and universities may seek to implement wellness programs, exercise plans, and/or other intervention techniques. Not only can these initiatives reduce the cost of healthcare for businesses and improve the health of students, but their impact on mood and affect is inherently advantageous. This study examined the impact of self-reported physical activity on a population of college students as it relates to academic performance and perceived stress.

Physical Activity

Physical activity has been shown to reduce the incidence of cardiovascular disease, cancer-related mortality (endometrial, breast, and colon cancers), hypertension, osteoporosis, obesity, and diabetes (American Institute for Cancer Research and World Cancer Research Fund, 2007; Warburton et al., 2006). Additionally, research has found that regular physical activity contributes to a reduction in premature death, with the most physically active people showing the lowest risk (Warburton et al., 2006). Topics surrounding physical activity and its impact on mental health will be discussed next, but as Fox (1999) claims, “exercise should be promoted regardless of its impact on mental health as it carries significant reduction in risks for a range of diseases and disorders for all sectors of society” (p. 416). That is, apart from the positive correlation revealed

between mood states and participation in physical activity, it is the view of some that society should engage in physical activity for the sheer physical benefits it can provide.

Obesity, one extreme of poor physical health, is considered an epidemic in the United States and in many other areas of the world. According to the Centers for Disease Control and Prevention, more than one-third of United States adults are obese (Ogden, Carroll, & Flegal, 2012). Its impact is not only widespread, it's also costly: Researchers found that the medical costs for people who are obese were \$1,429 (or 42%) higher per year than medical costs for normal weight individuals (Finkelstein, Trogon, Cohen, & Dietz, 2009). Obesity-related health issues include heart disease, type 2 diabetes, and some types of cancer, which are some of the leading causes of preventable death. The relationship between cancer and obesity is one area of physical health that warrants special attention. Research has revealed that physical activity can reduce the risk of and possibly prevent endometrial, breast, and colon cancers (Kruk & Aboul-Enein, 2006; Miles, 2007; Moore, Gierach, Schatzkin, & Matthews, 2010). As such, physical activity is not only helpful in reducing obesity, but also in reducing or preventing certain types of cancer.

Physical health benefits derived from physical activity could also include reduced absenteeism from school or work. Van Amelsvoort, Spigt, Swaen, and Kant (2006) found physically active workers reported significantly less absence than inactive workers, specifically due to less musculoskeletal disorders (14.8 versus 19.5 days per year, respectively). The benefits of physical activity may also go beyond bodily health and provide psychological benefit.

Mental Health

“Mental health and behavioral disorders are estimated to account for 13% of the global burden of disease,” but less than 1% of most country’s health budgets is spent on this phenomenon (Saxena, Van Ommeren, Tang, & Armstrong, 2005, p. 446). Downs and Ashton (2011) found that college students are at an especially high risk for developing mental health problems such as anxiety, stress-related issues, and depression. With such a large impact, methods that could decrease the prevalence of mental health issues should be examined. Anshel et al. (2010) state that “exercise tends to benefit, or improve, affect, mood state, and desirable emotions, while reducing anxiety, depression, and other forms of undesirable mental states” (p. 113). That is, physical activity has been shown to increase positive mood states and decrease negative mood states. Goodwin (2003) found support for this idea by demonstrating that regular physical activity decreases the likelihood of having clinical depression, generalized anxiety disorder, panic attacks, and specific phobias.

Because physical activity can have an impact on mood states and mental health issues like depression and anxiety, researchers have examined this relationship with other outcomes such as academic performance, workplace productivity, perceived stress levels and hassles, and absenteeism in the workplace. While the relationships between physical activity and depression and the relationship between physical activity and anxiety/stress are not the only mental maladies that have been investigated, these are most often linked to task and/or work performance. A brief review of the impact physical activity has on

these work-related outcomes will be reviewed, and longer term organizational outcomes and benefits will be discussed.

Depression and Work Productivity

A depressive disorder is a debilitating mental illness that impacts a large number of people around the world, and is predicted to be the second leading mental disease in 2020 (Brumby et al., 2011). Mild depression, or “a period of frequent episodes of unhappiness” is relatively common, but depressive disorder or clinical depression is a diagnosed illness that can impair day-to-day functioning (Fox, 1999, p. 412). Because depression is such a common and debilitating disorder, it can have an impact on many areas of life, including work performance, absenteeism, and academic performance (Downs & Ashton, 2011; Tyson et al., 2010). A meta-analysis conducted by Fox (1999) concluded that enough evidence has been found to support the theory of exercise as a treatment of clinical depression. Through the examination of over fifty studies examining this topic, Fox found solid evidence demonstrating that depression decreases as peoples’ level of exercise increases. Furthermore, Mutrie (2001) found that physical activity can be associated with a decreased risk of developing clinical depression, not just a means of treating it.

Tyson et al. (2010) found that the greater the amount of physical activity participants partook in, the greater the reduction in perceived levels of depression. That is, groups that participated in low to medium levels of physical activity showed less of a reduction in these areas, while the group that participated in the high level of physical activity showed significantly higher levels of reduction in levels of depression. While

some research has revealed vigorous exercise programs help to decrease symptoms of depression, Fox (1999) also found that smaller, single bouts of activity can improve mood, and that people who are generally more active consistently rate their own sense of mental well-being as higher than those who do not partake in any form of regular physical activity.

In the workplace, depression has been shown to lead to a decrease in productivity as well as an increase in absenteeism (Birnbaum, Cremieux, Greenberg, & Kessler, 2000; Druss, Rosenheck, & Sledge, 2000). Birnbaum et al. found that depression can lead to reduced performance while at work and sporadic absenteeism from work due to the symptoms from depression. In fact, workers with depression take between 1.5 to 3.2 more short-term disability days in a 30 day period than workers without diagnosed depression (Kessler et al., 1999). According to Kessler et al., this is a salary-equivalent productivity loss averaging between \$182 and \$395 per 30 day period. Druss et al. found that depression accounted for approximately 10 annual sick days on average, which was far more than conditions like hypertension, back problems, and those classified as “other.” Lastly, a survey of more than 2,000 employees in the UK revealed that over 90% of respondents who indicated poor mental health (25% of all respondents) acknowledged that it affects their workplace performance (Paton, 2009).

Although research has examined the relationship between depression and productivity/absenteeism, as well as the relationship between depression and physical activity, little research has investigated these variables as contingent upon one another.

That is, research examining the impact of physical activity on absenteeism caused by depression is scarce.

Anxiety, Stress, and Work Productivity

Anxiety and stress are two other mental health issues that impact a great number of people and can have a major impact on daily functioning. Research has shown that around 60% of undergraduate students show an increase in anxiety levels when they begin college (Tyson et al., 2010). Additionally, Makrides, Veinot, Richard, McKee, and Gallivan (1998) found that 60% of college students rated their stress levels as high or very high. In the workplace, structural changes, job insecurity, and other factors can contribute to high levels of stress and anxiety (Tennant, 2001). While some amount of stress and anxiety in the workplace is to be expected, chronic anxiety can be deemed a disorder and can have a great impact on many life functions. According to Harvard Medical School (2010, p. 3), “anxiety disorders cause significant work impairment. Generalized anxiety disorder, for example, results in work impairment (as measured by sick days and lost productivity) similar to that attributed to major depression.”

Research has shown physical activity to be beneficial in reducing feelings of stress, hassle, and anxiety (Nguyen-Michel, Unger, Hamilton, & Spruijt-Metz, 2006; Tyson et al., 2010). Research has demonstrated that higher levels of physical activity are significantly associated with lower levels of anxiety, with greater physical activity related to a greater decrease in perceived anxiety and stress levels (Tyson et al., 2010). Additionally, research has shown a modest association between hassles, or sources of difficulty and strain, and physical activity. Specifically, Nguyen-Michel et al. (2006)

found that physical activity was related to decreased perceived hassles at the collegiate level. Rueggeberg, Wrosch, and Miller (2011) found that over a two year period, adults with a high baseline of perceived stress that became engaged in regular physical activity reported less perceived stress and fewer increases in physical health symptoms (i.e. diabetes, heart condition, arthritis).

Reasonably, the impact of physical activity interventions on stress and anxiety has the potential to directly affect productivity. However, research surrounding this topic is limited. This study seeks to examine this matter further.

Reduction in Health-Related Costs

While physical activity has been shown to be beneficial for physical health and mental health, its advantages do not stop there. Physical activity is also regarded as a cost-effective and efficient alternative to pharmaceutical drugs that are used to treat the aforementioned physical and mental health issues that can cost employers significant amounts in healthcare costs (Church & Blair, 2009). As such, physical activity has been shown to decrease organizations' healthcare costs (Druss et al., 2000).

Employees' physical health improvement and maintenance can be beneficial for not only the individual, but also for the organization that employs them (Milano, 2007; Scotton, 2011; Thøgersen-Ntoumani, Fox, & Ntoumanis, 2005). One study found that poor health and adverse health risks related to physical inactivity, obesity, and smoking greatly increased health care charges within 18 months (Pronk, Goodman, O'Connor, & Martinson, 1999). The researchers of this study advise that companies implement strategic and preventative health care interventions in order to deter these increases in

health care charges. Marciniak, Lage, Landbloom, Dunayevich, and Bowman (2004) found that employees diagnosed with anxiety disorders have higher productivity costs and medical costs than those without.

Fox, Boutcher, Faulkner, and Biddle (2000) state that physical activity is a strong supporter, if not substitute, for pharmaceutical drugs when used for mental illnesses like depression and anxiety. Fox et al. (2000) found that physical activity is cost-effective, can be sustained throughout one's lifetime, and has benefits beyond the mental health realm (i.e., physical health). According to Lowe (2004), implementing wellness programs and physical activity intervention techniques would take businesses from health workplaces to health organizations. That is, physical activity intervention techniques could reduce the symptoms of stress, illness, and injury, and thereby reduce the costs the company fronts for these issues.

Corporate Advantages

While a decrease in health care costs is by itself an excellent reason to employ wellness interventions, the implementation of such programs could potentially increase organizational commitment and help enhance the image of the organization to potential employees (Thøgersen-Ntoumani et al., 2005). These researchers postulate that the benefits of wellness programs can extend past a reduction in healthcare costs and actually be recognized as a sign that the company cares and values its employees.

What Affects Exercise Involvement

Many factors can influence the level of physical activity in which people engage. Major life changes such as entering college, starting a new job, or family changes can

greatly influence the amount, intensity, and consistency of exercise a person partakes in; consequently, these factors may affect mental and physical health (Downs & Ashton, 2011; Nguyen-Michel et al., 2006).

The aforementioned life changes can effect participation in physical activity for several reasons. These reasons can include a lack of knowledge regarding available physical activity resources (e.g. fitness centers, health and wellness consultants), increases in workload levels that people are not prepared for, and so on (Brown et al., 2011). Nelson, Gortmaker, Subramanian, Cheung, and Wechsler (2007) revealed the first year of college is a specific life change that leads a major decline in physical activity. Associated with this decline in physical activity is an increase in perceived stress and a decrease in mental health (Anshel et al., 2010; Bacon et al., 2002).

Because major life changes can lead to a decrease in physical activity, and physical activity has proven benefits on a variety of levels, it is important to recognize and address the life changes. That is, the implementation of wellness programs, increased knowledge of physical activity resources, and intervention techniques are especially important and should be utilized in places of high stress and change, such as the workplace and in colleges.

Intervention Techniques

Examining the impacts of physical activity on mental and physical health can be beneficial for many reasons. For instance, wellness programs in the workplace or at academic institutions could have a positive impact on productivity, job satisfaction, and absenteeism. However, as previously stated, life changes such as entering the workforce

and beginning college come with a decline in physical activity, so techniques to intervene in this decline could be extremely beneficial when implemented effectively. With effective intervention techniques in place, colleges, businesses, and other places that necessitate productivity or provide health benefits could potentially improve the overall mental health of their subjects, increase physical health, increase productivity, and see a decline in perceived stress (Hollar et al., 2010).

Intervention techniques can include implementing a fitness routine for employees or students, and increasing awareness of physical activity resources. Additionally, it should be mentioned that utilizing a non-diet approach to wellness intervention has been shown to be beneficial, longer lasting, and reveal greater health benefits than techniques that emphasize dieting in the program (Bacon et al., 2002). These researchers found that while many programs emphasize dieting to improve overall health, a non-diet approach “can produce similar health improvements, while at the same time effectively minimizing the attrition problems common to participants in diet programs” (p. 864). That is, those who participate in diet programs often regain their lost weight after the program concludes; however, in programs that emphasize physical activity participants are more likely to keep with the program and less likely to regain the weight lost.

While the impacts are positive, research has revealed that it is difficult for employees and students to adhere to the techniques that many wellness interventions employ (Anshel et al., 2010). According to Faulker and Tayler (2009), specific planning, well-trained staff, and sufficient resources are essential to create and maintain a successful intervention method or methods. Additionally, Milano (2007) suggests the

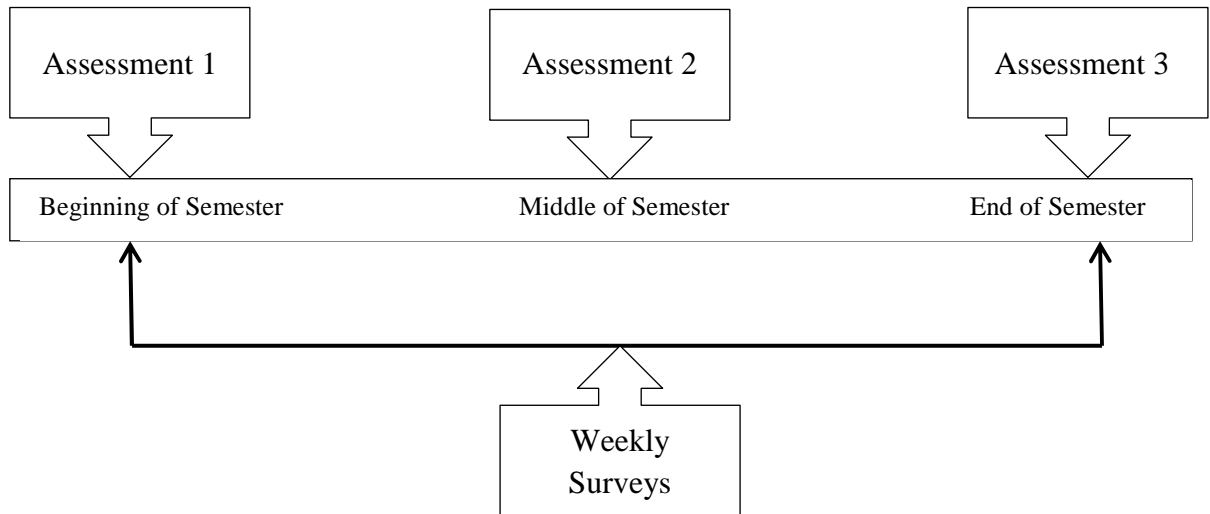
removal of barriers is key for the success of an exercise or wellness program in the workplace. There are several issues to consider when implementing an intervention technique. Availability of resources, employee buy-in, and other related issues should be taken into account.

Current Study

The current study utilized data collected as part of a larger research effort which examined the impact of a wellness intervention on levels of physical activity in college freshmen (Dougall, Swanson, Grimm, Jenney, & Frame, 2011). The omnibus goal of the previous research was to examine the levels of physical activity of college freshmen with the implementation of feasible intervention techniques by a campus recreation facility. As part of the larger study, participants responded to three surveys administered at the beginning of the semester (Assessment 1), the middle of the semester (Assessment 2), and at the end of the semester (Assessment 3). Each of these surveys covered physical activity related information, as well as information regarding perceived health, perceived stress, and perceived academic performance. The first survey (Assessment 1) also included demographic information. In addition to these surveys, participants completed brief diary-type surveys each week (weekly surveys) to assess their current levels of physical activity, perceived stress, and time spent at work, if applicable.

In the previous study, data were analyzed to determine changes in physical activity participation when a brief intervention technique was introduced. The intervention techniques were designed to minimize the rate of decline in physical activity,

as well as increase the use of the university fitness center. Below is a timeline of the previous study from the beginning to the end of the academic semester.



Using the aforementioned data, the current study examined the influences of physical activity on perceived academic performance and perceived levels of stress in undergraduate students. Descriptions of the self-report measures for each variable can be found in CHAPTER II: METHODS.

Hypotheses

H1: Reports of physical activity will be positively associated with students' self-perceptions of effective academic performance (Academic Conscientiousness).

H2: Reports of physical activity will be negatively associated with self-reports of school and work conflict (Work-Study Interference Scale).

H3: During periods in which students report elevated stress, physical activity will be negatively associated with those reports.

CHAPTER II: METHODS

Participants

The data used for this study was collected at a university in the Southwest United States. Two waves of the study were conducted. The first round was in the spring of 2009 and the second was in the fall of 2009. Freshmen students who indicated they were eligible for participation ($N = 167$) were in the psychology human research participant pool and received course credit for their participation in all phases of the research. Nine individuals from this pool did not complete the first survey, and three other individuals were deemed ineligible after starting the study (they were transfer students or were not freshmen). Nine other participants submitted data, but the data was not usable in the analysis. The remaining 146 participants were deemed eligible for participation (spring semester, $N = 77$; fall semester, $N = 69$).

The previous study included 102 women and 43 men. The participant ethnicity was as follows: White ($N = 53$), African American ($N = 29$), Asian ($N = 21$), Hispanic ($N = 34$), other ($N = 31$), and no answer ($N = 12$). The range of participant age was from 17 to 47 years of age, with $M = 20.6$. The majority of participants were employed ($N = 87$ vs. $N = 58$, and $N = 1$ not provided). Participant demographics were not related to assignment into the intervention groups or to attendance of these groups ($p < .05$).

Measures

Physical Activity. Participants were asked to record their estimation of physical activity in the past year as a baseline of previous physical activity levels. To assess Current Status of physical activity, each of the three (3) Assessments contained questions

regarding the performance of one or more physical activities during the participants' free time. Questions were on a 5-point scale of 1 = "I have not considered doing this or do not wish to at this time" to 5 = "I am currently doing this regularly and plan to continue to do so" (see Appendix B). This allowed us to determine participants' stage of change at each assessment.

The weekly assessments contained the Godin Leisure-Time Exercise Questionnaire (Godin & Shephard, 1997). Each week participants were asked to provide the amount times they partook in light, moderate, and strenuous physical activity within the past 7 days. This was modified from the original scale which asked about a typical 7-day period. Additionally, they were asked how often they engaged in any regular activity long enough to work up a sweat (heart beats rapidly), which was rated as 1 = "sometimes," 2 = "never," or 3 = "always." See Appendix C.

Perceived Stress. To assess perceived stress, the 4-item version of the Perceived Stress Scale was used (Cohen, Kamarck, & Mermelstein, 1983; Cohen & Williamson, 1988). The three (3) Assessments and weekly surveys contained the Perceived Stress Scale. This questionnaire measured a participant's perceived level of control over life situations and hassles from life situations. An example item is "In the last week, how often have you felt difficulties were piling up so high that you could not overcome them?" These items were rated using a 5-point scale from 1 = "never" to 5 = "very often." See Appendix D. Scale reliability of the 4-item Perceived Stress Scale was reported as $\alpha = .60$ (Cohen, Kamarck, & Mermelstein, 1983).

Work-Study Interference. Participants also completed the Work–Study Interference Scale in each of the three (3) Assessments to evaluate the extent to which their work interfered with their ability to meet school-related demands and responsibilities (Derous & Ryan, 2008). This variable was measured with 12 items, adapted from Barling, Rogers and Kelloway (1995) and Markel and Frone (1998). Example items are: “My work conflicts with my study activities” and “My work takes up time that I’d like to spend on my studying.” These items were rated using a 5-point scale from 1 = “strongly disagree” to 5 = “strongly agree.” See Appendix E. Scale reliability of the Work-Study Interference Scale was reported as $\alpha = .94$ in previous research (Derous & Ryan, 2008).

Academic Performance. Items were developed for the original study and used to assess the degree to which a student was studying effectively, keeping up with their workload, as well as performing well on exams, tests, and assignments. Each of the three (3) Assessments contained the additional Academic Performance items (see Appendix F). These items were intuitively developed, but were be factor analyzed to determine if they assessed a particular construct or concept. The items were rated using a 5-point scale from 1 = “strongly disagree” to 5 = “strongly agree.” The factor solution can be found in CHAPTER III: RESULTS.

CHAPTER III: RESULTS

Three specific results were anticipated. First, we anticipated the analyses would demonstrate a positive correlation between the amounts of physical activity performed by participants and perceived academic performance. Second, we expected participation in physical activity would positively correlate with participants' productivity outside the classroom regarding classroom related exercises (e.g. homework, studying). Third, we anticipated results would show that physical activity lowered students' perceived stress levels during times with potential elevated stress (i.e. midterms).

Exploratory Factor Analysis

We performed an exploratory factor analysis (EFA) with equamax rotation on the Assessment 1 self-report items involving perceived academic performance (see Appendix B.). A three factor solution of academic performance was revealed in the EFA. Factor 1 was identified as Academic Contentiousness, Factor 2 was identified as Academic Distractibility, and Factor 3 was identified as Academic Satisficing. These three factors accounted for 37% of the total variance. A fourth factor was examined, but no common theme was found among the items. Scale reliability was computed for each scale to determine the best fit of each item. Final scale reliability for all items was high. Academic Contentiousness consisted of 25 items ($\alpha = .89$), Academic Distractibility consisted of 12 items ($\alpha = .85$), and Academic Satisficing consisted of 8 items ($\alpha = .83$). See Table 1 for factor loadings.

Hypothesis Tests

For all tests of hypotheses, a familywise alpha of .05 was used. Reverse coding was performed when necessary. To examine H1, correlational analyses were conducted on the fourteen weekly reports of physical activity (Godin Leisure-Time Exercise Questionnaire) and Factor 1: Academic Contentiousness. No significant results were found. To determine an answer to H2, correlations were calculated between the weekly reports of physical activity (Godin Leisure-Time Exercise Questionnaire) and the Work-Study Interference Scale responses. Scale reliability for the Work-Study Interference Scale was found to be $\alpha = .98$ for Assessment 1, $\alpha = .99$ for Assessment 2, and $\alpha = .99$ for Assessment 3. Once again, no significant findings were revealed.

A repeated measures ANOVA was performed on the weekly reports for physical activity and the Perceived Stress Scale. Varying levels of reported stress were found throughout the semester (see Table 2). For H3, correlations between physical activity and Perceived Stress Scale responses were calculated. Significant positive correlations were found for weeks in which stress levels were elevated. A summary of these correlations can be found in Table 4. It should be noted that this result was found for reported measures of regular physical activity, but not for a specific level of activity (i.e. strenuous, moderate, or mild) within the Godin Leisure-Time Exercise Questionnaire. Correlations were positive due to the wording of the regular physical activity question: “During the past 7-Day period (week), in your leisure time, how often did you engage in any regular activity long enough to work up a sweat (heart beats rapidly)?” with 1 = Often, 2 = Sometimes, and 3 = Never. Therefore, those who did not partake in regular

physical activity within the 7-day period reported higher levels of perceived stress than those who did partake in regular physical activity. Scale reliability for the Perceived Stress Scale can be found in Table 3.

Analyses revealed a significant decrease in the Academic Conscientiousness factor over the school year, but this was not shown to be related to physical activity or regular exercise. When examining hours worked and regular physical exercise, no correlation was found.

CHAPTER IV: DISCUSSION

Previous research has revealed that physical activity can have a positive effect on physical health, mental health, academic performance, work productivity, and several other aspects of life. This study was completed to support and enhance these findings by examining the relationship between physical activity and perceived academic performance, physical activity and work-study interference, and physical activity and perceived stress. One of the three proposed hypotheses (H3) was supported through our analyses. The implications of these results are discussed below.

Hypothesis 1, “Reports of physical activity will be positively associated with students’ self-perceptions of effective academic performance (Academic Conscientiousness),” was not supported in our analyses. This is unique, as many other studies have found that physical activity correlates with greater academic performance (Dwyer, Sallis, Blizzard, Lazarus, & Dean, 2001; Wi-Young, 2012). It is possible that the self-report measures may not have been an accurate measurement of actual academic performance. Issues with self-report measures are discussed in the Limitations and Future Research section of this document. However, it is also possible that these results reveal that regular physical activity does not have the impact on perceived academic performance that research has previously supported. Examining the measure of Academic Conscientiousness with physical activity in a separate study could help to determine if the present study’s findings are spurious.

Hypothesis 2, “Reports of physical activity will be negatively associated with self-reports of school and work conflict (Work-Study Interference Scale),” was also not

supported. The results of this analysis indicate that regular physical activity did not significantly correlate with balancing work and study for the participating college students. It is possible that there was not enough power in this study to reveal a significant correlation between these measures. Because the population of this study was first year (freshman) college students, many of the participants did not have jobs. Additionally, those who did have jobs may not have worked hours per week to have a significant impact on their studies or feelings at school. Scale reliability did not seem to be an issue as our Cronbach's alphas were comparable to previous research.

Hypothesis 3, "During periods in which students report elevated stress, physical activity will be negatively associated with those reports," was supported through our analyses. Correlations revealed that participants who indicated they had not exercised regularly in the past 7 days reported higher perceived stress than those who did exercise regularly. Previous research also supports this notion and has shown physical activity to be beneficial in reducing feelings of stress, hassle, and anxiety (Nguyen-Michel, Unger, Hamilton, & Spruijt-Metz, 2006; Tyson et al., 2010). It is important to note that the negative correlation was prevalent during specific weeks throughout the semester, most likely correlating with semester exams or other periods of high stress. This finding is important for several reasons. First, it reaffirms the finding that regular physical activity can reduce feelings of stress, specifically in high stress situations. In the workplace, regular physical activity could help reduce feelings of stress during deadlines or an increased workload. As previously stated, regular physical activity has been shown to be an adequate substitution for pharmaceutical drugs used to reduce stress (Fox, Boutcher,

Faulkner, & Biddle, 2000). High levels of stress and anxiety are correlated with higher productivity and medical costs (Marciniak, Lage, Landbloom, Dunayevich, & Bowman, 2004). As such, workplace wellness programs that encourage regular physical activity have the potential to reduce the costs a company fronts for these issues. In academic institutions, regular physical activity could help students manage their stress during midterms or finals. Additionally, higher levels of stress are correlated with decreased productivity (Tarafdar, Tu, Ragu-Nathan, & Ragu-Nathan, 2007), so reducing stress is inherently beneficial for both college students and professionals.

Limitations and Future Research

There are several limitations to this study that should be acknowledged. Perhaps the most significant is the accuracy self-report measures. Research has shown correlations between self-report and direct (actual) report measures for physical activity to be moderate to low (Prince et al., 2008). Prince and colleagues (2008) suggest that the measurement method could have a significant impact on the results of a study. For instance, within this study, it is possible that some participants may have been more influenced by the weekly reporting and tracked their physical activity more carefully, while others may have not monitored their physical activity as closely. Direct tracking of athletic center or gym usage, as well as actual academic performance (test grades), would be beneficial in future studies to avoid a distortion of results from inaccurate or imprecise self-reports.

Another potential limitation is that all of the participants were freshmen from one university. Because of this, generalization to all college students across colleges may not

be accurate. Furthermore, generalization to the workforce is difficult with the limited variety of participants. Future research could examine similar aspects in the workforce, utilizing the self-report measures outlined in this report.

Lastly, this report utilized data from an extensive research study that had a specific focus and approach, namely, exercise intervention. Focusing the design of a study for the measurements of work-study interference, perceived academic performance, and perceived stress may be beneficial. Researchers could consider this approach in future endeavors.

Conclusion

The present study examined the impact of physical activity on perceived stress, work-study interference, and perceived academic performance. Significant findings were revealed for regular physical activity and perceived stress, which is consistent with previous research. Both academic institutions and places of work can benefit from these findings. The findings of lower perceived stress indicate that employees in high stress positions, employees with a heavy workload, and a workforce in during times of especially high stress could benefit from fitness programs and fitness related interventions.

No support was found for the correlation of regular physical activity and work-study interference, or regular physical activity and academic performance. These findings are inconsistent with previous research. Follow-up studies should be conducted to conclude if these findings were spurious, or if they indicate that physical activity does not have the perceived effects previously determined.

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APPENDICES

APPENDIX A

Table 1 *Factor Loadings based on a Rotated Component Matrix (Equamax)*

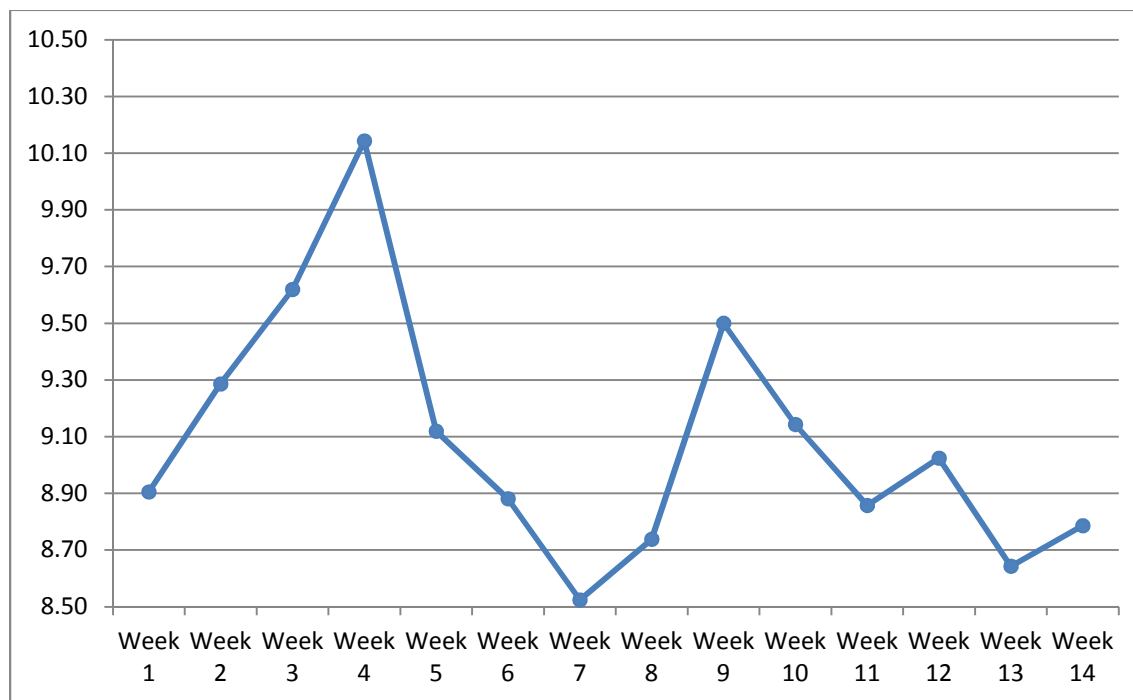
Item	<i>Academic Conscientiousness</i>	<i>Academic Distractibility</i>	<i>Academic Satisficing</i>
21. I try to apply the material I have learned to my daily life and the world around me.	.44		
22. When I am reading the text, I try to remember the definitions in the text word for word.	.33		
23. I try to put the material I am learning into my own words.	.46		
24. I complete practice questions in my textbooks, even when they have not been assigned.	.45		
28. I work hard for my grades.	.59		
29. I have not turned in any class assignments late.	.57		
30. I have not missed any class assignments.	.68		
31. I recognize possible exam questions when I read the text and review my notes.	.59		
32. I write my own practice test questions when I am studying.	.46		
34. When reading for class, I pause from time to time to review what I have read.	.31		
35. I read the assigned chapters and materials before class.	.37		
36. After class I review my lecture notes.	.35		
38. I highlight (or underline) a lot.	.54		
40. My highlighting (or underlining) is useful when I study for a test.	.57		
41. If there is a website for my text, I use it to help me study.	.40		
42. I ask for help if I am having difficulty in a course.	.55		
43. I attend review sessions for my classes if they are offered.	.56		
44. I focus on the bold face and italicized words in the text.	.50		
45. I have a study partner (or study group) for my courses.	.32		

Table 1 *Factor Loadings based on a Rotated Component Matrix (Equamax)*

Item	<i>Academic Conscientiousness</i>	<i>Academic Distractibility</i>	<i>Academic Satisficing</i>
46. I have a schedule and I stick to it.	.50		
47. I set aside a specific length of time to study.	.51		
49. I tend to study on weekends.	.45		
56. I review the exam questions and my answers to make sure I did not make any errors.	.60		
58. I always go to class.	.66		
61. For every hour I'm in class, I study (or read) approximately three hours.	.47		
14. I don't listen and sometimes lose track of the lecture.		.69	
15. I can only concentrate on my coursework if there is background noise (TV, music, etc.).		.40	
16. I find that my mind wanders when I study.		.72	
17. It is hard to pay attention to lectures.		.80	
18. It is easy to distract me from my studies.		.61	
20. During lectures I think about other things and I don't listen to the instructor.		.72	
26. It is difficult to complete course work when I am having difficulty in the class.		.35	
37. I often re-read a chapter or section several times before I am able to identify the important points.		.53	
39. Lectures make more sense when they follow the same format as the text.		.38	
25. I do what is required, nothing more, nothing less.			.58
27. I put off completing assignments that are challenging or long.			.52
33. I only review my notes a day or two before the exam.			.69
48. I put off studying until the last minute.			.81
50. I tend to cram for exams.			.71

Table 1 *Factor Loadings based on a Rotated Component Matrix (Equamax)*

Item	<i>Academic Conscientiousness</i>	<i>Academic Distractibility</i>	<i>Academic Satisficing</i>
51. I blow off studying so that I can spend time with friends.			.48
52. I focus on one assignment (or test) at a time rather than plan out my week or semester.			.49
53. I learn more when I cram for exams.			.47

Table 2 *Estimated Marginal Means of Perceived Stress Scale*Table 3 *Perceived Stress Scale (PSS) by Week (W)*

	<i>M</i>	<i>SD</i>	<i>N</i>	α
PSS W1	8.90	3.65	142	.62
PSS W2	9.29	3.12	152	.73
PSS W3	9.61	3.50	71	.76
PSS W4	10.14	3.53	102	.80
PSS W5	9.12	3.65	133	.77
PSS W6	8.88	3.25	134	.75
PSS W7	8.52	2.77	73	.75
PSS W8	8.74	2.94	136	.81
PSS W9	9.50	3.29	137	.83
PSS W10	9.14	2.85	139	.79
PSS W11	8.86	3.30	139	.81
PSS W12	9.02	3.18	134	.80
PSS W13	8.64	3.55	134	.81
PSS W14	8.79	3.54	67	.81

Table 4 *Correlations of Perceived Stress Scale with Regular Physical Exercise*

Week	<i>r</i>	<i>p</i>	<i>N</i>
1	.17*	.04	141
2	.18*	.02	150
3	.22	.07	69
4	.21*	.03	101
5	.23**	.01	132
6	.17	.06	133
7	-.03	.78	73
8	-.01	.88	134
9	.19*	.03	137
10	.16	.07	138
11	.25**	.00	139
12	.20*	.03	131
13	.21*	.02	133
14	.01	.97	67

Note: * $p < .05$, ** $p < .01$

APPENDIX B

Current Physical Activity Status Items

For the following activities, please indicate your current status about performing the activity regularly by recording a number 1-5 using the scale given below:

1 2 3 4 5

1 = I have not considered doing this or do not wish to at this time

2 = I have considered doing this but have not yet done so

3 = I am doing this and have considered doing this regularly, but I am not currently doing this regularly

4 = I have recently begun doing this regularly

5 = I am currently doing this regularly and plan to continue to do so

1) One or more physical activities during your free time

2) Use the Maverick Activities Center (UT Arlington Fitness Center/Gym)

3) *Strenuous* exercise (heart beats rapidly, e.g., running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling)

4) *Moderate* exercise (not exhausting, e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing)

5) *Mild exercise* (minimal effort, e.g., yoga, archery, fishing from river bank, bowling, horseshoes, golf, snow-mobiling, easy walking)

APPENDIX C

Godin Leisure-Time Exercise Questionnaire

12) During the past 7-Day period (week), how many times on the average do you do the following kinds of exercise for more than 15 minutes during your free time (write in each box the appropriate number).

Times per Week

a) STRENUOUS EXERCISE (HEART BEATS RAPIDLY) _____

(e.g., running, jogging, hockey, football, soccer, squash, basketball,
cross country skiing, judo, roller skating, vigorous swimming,
vigorous long distance bicycling)

b) MODERATE EXERCISE (NOT EXHAUSTING) _____

(e.g., fast walking, baseball, tennis, easy bicycling, volleyball,
badminton, easy swimming, alpine skiing, popular and folk dancing)

c) MILD EXERCISE (MINIMAL EFFORT) _____

(e.g., yoga, archery, fishing from river bank, bowling, horseshoes,
golf, snow-mobiling, easy walking)

13) During the past 7-Day period (week), in your leisure time, how often did you engage in any regular activity long enough to work up a sweat (heart beats rapidly)? (Select

One) 1. OFTEN 2. SOMETIMES 3. NEVER/RARELY

APPENDIX D

Perceived Stress Scale

8) In the last week, how often have you felt that you were unable to control the important things in your life?

0=never 1=almost never 2=sometimes 3=fairly often 4=very often

9) In the last week, how often have you felt confident about your ability to handle your personal problems?

0=never 1=almost never 2=sometimes 3=fairly often 4=very often

10) In the last week, how often have you felt that things were going your way?

0=never 1=almost never 2=sometimes 3=fairly often 4=very often

11) In the last week, how often have you felt difficulties were piling up so high that you could not overcome them?

0=never 1=almost never 2=sometimes 3=fairly often 4=very often

APPENDIX E

Work-Study Interference Scale

Please complete the following questions regarding the extent to which work interferes with your ability to meet school-related demands and responsibilities.

Use the following scale for your responses.

1	2	3	4	5
disagree strongly	neither disagree nor agree			strongly agree

1. My work conflicts with my study activities.
2. After work, I come home too tired to do study or to do some homework.
3. On the job, I have so much work that it takes away from my school interests.
4. I am preoccupied with my work while I'm studying / at school.
5. Because my work is demanding at times I am irritable during class hours or when studying.
6. The demands of my job make it difficult to concentrate on my study.
7. My work takes up time that I'd like to spend on my studying.
8. My job makes it difficult to be the kind of student that I'd like to be.
9. Because of my job, I go to school tired.
10. My job demands and responsibilities interfere with my study or schoolwork.
11. I spend less time studying and doing homework because of my job.
12. When I'm at school, I spend a lot of time thinking about my job.

APPENDIX F

Additional Academic Performance Variables, used to supplement to the original Work-Study Interference Scale (developed by Dr. Mark Frame)

13. It is easy for me to concentrate when studying.
14. I don't listen and sometimes lose track of the lecture.
15. I can only concentrate on my coursework if there is background noise (TV, music, etc.).
16. I find that my mind wanders when I study.
17. It is hard to pay attention to lectures.
18. It is easy to distract me from my studies.
19. If I get distracted, I can quickly refocus my attention.
20. During lectures I think about other things and I don't listen to the instructor.
21. I try to apply the material I have learned to my daily life and the world around me.
22. When I am reading the text, I try to remember the definitions in the text word for word.
23. I try to put the material I am learning into my own words.
24. I complete practice questions in my textbooks, even when they have not been assigned.
25. I do what is required, nothing more, nothing less.
26. It is difficult to complete course work when I am having difficulty in the class.
27. I put off completing assignments that are challenging or long.
28. I work hard for my grades.
29. I have not turned in any class assignments late.
30. I have not missed any class assignments.
31. I recognize possible exam questions when I read the text and review my notes.
32. I write my own practice test questions when I am studying.

33. I only review my notes a day or two before the exam.
34. When reading for class, I pause from time to time to review what I have read.
35. I read the assigned chapters and materials before class.
36. After class I review my lecture notes.
37. I often re-read a chapter or section several times before I am able to identify the important points.
38. I highlight (or underline) a lot.
39. Lectures make more sense when they follow the same format as the text.
40. My highlighting (or underlining) is useful when I study for a test.
41. If there is a website for my text, I use it to help me study.
42. I ask for help if I am having difficulty in a course.
43. I attend review sessions for my classes if they are offered.
44. I focus on the bold face and italicized words in the text.
45. I have a study partner (or study group) for my courses.
46. I have a schedule and I stick to it.
47. I set aside a specific length of time to study.
48. I put off studying until the last minute.
49. I tend to study on weekends.
50. I tend to cram for exams.
51. I blow off studying so that I can spend time with friends.
52. I focus on one assignment (or test) at a time rather than plan out my week or semester.
53. I learn more when I cram for exams.
54. I often misunderstand exam questions.

55. When I am taking exams, I feel like I studied the wrong material.
56. I review the exam questions and my answers to make sure I did not make any errors.
57. My exams are “tricky” because the professor make the questions hard to understand.
58. I always go to class.
59. I am late for class sometimes.
60. If the lectures are straight from the book, I don't go to class.
61. For every hour I'm in class, I study (or read) approximately three hours.

APPENDIX G



October 23, 2012

Stephanie Eide, Dr. Mark Frame
Department of Psychology
spe2b@mtmail.mtsu.edu, Mark.Frame@mtsu.edu

Protocol Title: "College Students Perceived Stress and Academic Performance: The Impact of an Exercise Intervention"

Protocol Number: 13-105

Dear Investigator(s),

The exemption is pursuant to 45 CFR 46.101(b) (4). This is because the research being conducted involves the collection or study of existing data that is being recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.

You will need to submit an end-of-project report to the Office of Compliance upon completion of your research. Complete research means that you have finished collecting data and you are ready to submit your thesis and/or publish your findings. Should you not finish your research within the three (3) year period, you must submit a Progress Report and request a continuation prior to the expiration date. Please allow time for review and requested revisions. Your study expires on **October 23, 2015**.

Any change to the protocol must be submitted to the IRB before implementing this change. According to MTSU Policy, a researcher is defined as anyone who works with data or has contact with participants. Anyone meeting this definition needs to be listed on the protocol and needs to provide a certificate of training to the Office of Compliance. **If you add researchers to an approved project, please forward an updated list of researchers and their certificates of training to the Office of Compliance before they begin to work on the project.** **Once your research is completed, please send us a copy of the final report questionnaire to the Office of Compliance.** This form can be located at www.mtsu.edu/irb on the forms page.

Also, all research materials must be retained by the PI or **faculty advisor (if the PI is a student)** for at least three (3) years after study completion. Should you have any questions or need additional information, please do not hesitate to contact me.

Sincerely,
Andrew W. Jones
Graduate Assistant to:
Emily Born
Compliance Officer
615-494-8918
Emily.Born@mtsu.edu