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Sedentary Behaviors and Physical Activity in Relation to Class Standing in University Students

By

Codie W. Monhollen

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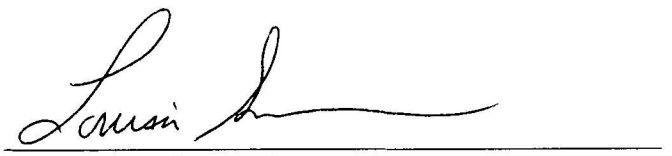

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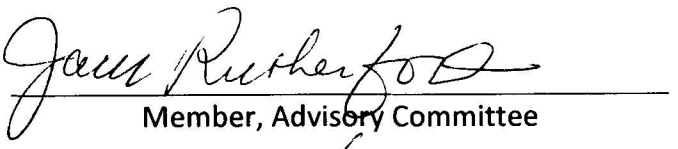

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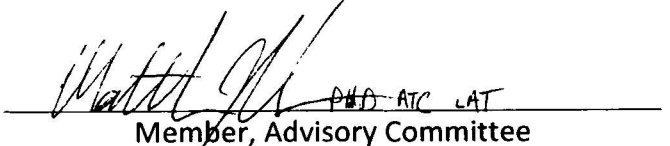

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Sedentary Behaviors and Physical Activity in Relation to Class Standing in University Students

By

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Masters of Science
Eastern Kentucky University
Richmond, Kentucky
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ABSTRACT

The researcher studied sedentary behaviors and physical activity (PA) of university students in relation to class standings. Participants were 294 university students for the Sedentary Behavior Questionnaire (SBQ) and 264 students for the International Physical Activity Questionnaire (IPAQ) selected from the College of Health Sciences. Sedentary Behaviors were analyzed using the SBQ, consisting of 9 behavior items, separated into weekday and weekend behavior. Additionally, PA was assessed using the IPAQ. On average students spent 37hr in sedentary behaviors during a normal 5 day week. Statistical significance was found between class standing for playing computer/video games, paperwork/computer, and transportation for weekday sedentary behaviors. Significance was also noted for gender differences within the SBQ and IPAQ. On average all students meet the weekly recommended amount of physical activity according to American Heart Association and American College of Sports Medicine. This study provided the first objective measure of time spent in physical activity and sedentary behaviors in relation to class standing and indicates that certain behaviors change over time as demands increase on the student.

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CHAPTER 1

INTRODUCTION

Despite the wealth of knowledge on the importance of being physically active, the majority of Americans live a sedentary lifestyle (Calfas et al., 2000). Typically this sedentary behavior emerges between the ages of 16 to 19, where moderate and vigorous activity decrease or stops (Trost, et al. 2002; Troiano et al, 2007). This decrease in physical activity during high school leads to a greater susceptibility to weight gain while attending college (Lloyd-Richardson, Baily, Fava, & Tobacco Etiology Research Network, 2009). According to Crombie, Llich, Dutton, Panton, & Abood (2009) this occurs because of increased demands placed on the university student, which could otherwise be used for being physically active. Moreover, a recent survey by the National College Health Association (2010) indicates that only 52.3% of male and 43.6% of female college students met the recommended daily amount of physical activity on at least three of the past seven days. Additionally, the American College of Sports Medicine recommends 30 minutes of moderate physical activity five days a week (Haskell et al, 2007). This decrease in physical activity is a serious and important health matter that needs further research, as many health behaviors that carry over into adulthood are established during late adolescence (US Dept Health and Human Services: Healthy people 2010, 2000; Tammelin, et al. 2003).

Although a number of national samples have described physical activity and exercise in various populations (National College Health Risk Behavior Survey, 1995; Canadian Community Health Survey, 2006; Troiano, et al. 2007; National College Health

Assessment: 2010), there is limited research examining student sedentary behavior and physical activity in regards to class standing. A lack of physical activity has been associated with poor physiological wellbeing, such as increased risk of obesity, high blood pressure, heart disease, and type II diabetes (Haskell et al, 2007). Research is now showing that there is need to better understand sedentary behavior in order to effectively impact physical activity (Hu, Li, Colditz, Willett, & Manson 2003). Sedentary behaviors such as television watching have been associated with obesity in children (Anderson, Crespo, Bartlett, Cheskin, & Pratt, 1998) and adults (Salmon, Bauman, Crawford, Timperio, & Owen, 2000).

A meta-analysis by Marshall et al. (2004) showed that sedentary behaviors are related to be being physically inactive and is significantly associated with increased fatness. However, Prochaska, Sallis, Sarkin, and Calfas (2000) showed that television watching was not strongly related to 14 physical activity variables, but was correlated to physiological indicators of fitness, such as heart rate. In addition to watching television, there are a number of sedentary behaviors that compete with physical activity, such as computer use, reading, studying, and socializing that impact fitness levels. Likewise, a study conducted with Australian adults showed that those who spent significant amounts of time on the computer were most likely to be inactive (Fotheringham, Wonnacott, & Owen, 2000). More importantly, sedentary behavior is perceived to have increased over the past decade, because of the increase usage of computers and internet on a daily (Matthew et al., 2003; Taveras et al., 2007) Screen time, such as computers, television, and video games may be influenced in university students by the rise of social media sites. Prior to the rise of social media, estimates for computer use ranged from 2.8 hours

per week (Bureau of Labor Statistics, 2014) to 11.6 hours per week (Anderson, 2001). None the less it appears that the majority of the college student's leisure time is spent on screen time. Conversely, the influences of sedentary behavior on physical activity levels are not yet completely understood and require further investigation. Additionally, more than 18.2 million individuals are enrolled at a university or college (US Census Bureau, 2007), despite this, there is minimal research about their sedentary behaviors and physical activity levels (Hung et al., 2003; Keating, Guan, & Bridge, 2005). Research has been indeterminate in regards to the relationship of sedentary behaviors and physical activity levels within different demographics, such as children (Sallis, Prochaska, & Taylor, 2000; Marshall, Biddle, Gorely, & Cameron, 2004; Horst, Paw, Twisk, & Mechelen, 2007), college students (Prochaska, Sallis, Sarkin, & Calfas, 2000), and adults (Foster, Gore, & West, 2006).

However, one of the more popular hypotheses explaining the differences in sedentary behaviors and physical activity is the displacement hypothesis (Buckworth & Nigg, 2004). This hypothesis suggest that the more time an individual devotes to a sedentary behavior, the less time he or she will devote to physical activity (Muts, Roberts, & Vuuren, 1993). This hypothesis also states that in order for this to occur, a new activity must be introduced to force out an old activity or behavior (Buckworth & Nigg, 2004). Over the past few decades, screen time has increased, while at the same time physical activity has decreased, contributing to an increase in obesity, particularly in youth (Lobstein, Baur, & Uauy, 2004; Wareham, Sluijs, & Ekelund, 2005; Jackson, Djafarian, Stewart, & Speakman, 2009). If physical activity is replaced by sedentary

behaviors such as screen time, the relationship may be explained by the displacement theory.

Understanding the engagement of physical activity and sedentary behaviors is important for intervention efforts encouraging more active life-styles (Biddle, Gorely, & Stensel, 2004). This is important in understanding out individuals interact within their environment or settings. According to Swinburn, Caterson, Seidell, and James, (2004), individuals interact in a variety of ways depending on their environment and surroundings, which in turn are influenced by government, food industry, and other sectors of society; which within our case, class standing in university students. Importantly, to our knowledge there are no studies that specifically look at sedentary behaviors and physical activity according to class standing in university students.

Purpose of Investigation

Therefore, the purpose of this study is to analyze sedentary behaviors and physical activity in relation to class standing. In addition a segment of the data will be analyzed based on gender differences, as research has shown this to have a significant impact on physical activities and barriers to physical activity(Wallace & Buckworth, 2001; Buckworth & Nigg, 2004), such as television and computer use (Buckworth & Nigg, 2004).

Hypotheses

The research hypotheses are as follows: 1) computer use will increase according to class standing; 2) television viewing will increase as physical activity levels decrease;

3) increase in class standing will show a decrease in physical activity and increase in sedentary time; 4) time spent in sedentary behaviors will decrease for the weekend compared to week day; 5) students will not meet the daily recommended amounts of physical activity; 6) and males will be more physically active than females.

Population

450 male and female participants between the ages of 18-40 years old will be recruited through Eastern Kentucky University's Exercise & Sport Science and health majors during the Fall 2014 semester. Student classifications are the following: Freshmen 0-29 hours, Sophomores 30-59 hours, Juniors 60-89 hours, Seniors 90 or more hours, and Graduate students. After indicating interest in the study, participants will be asked a series of questions. These questions relate to demographic information such as age, race, sex, class rank and non-traditional student status. Participants who are not fulltime (less than 12 credit hours & less than 9 credit hours for graduate students) will be excluded from the study. Approximately 90-100 participants will be recruited from each class rank.

Limitations

It is understood that the students may or may not be completely truthful when responding to the questionnaires. Also, the questionnaires may be inadequate because it may not complete a full picture of the subjects, feelings, emotions, and behavior. Individuals may read differently into each question and therefore reply based on their own interpretation of the question - i.e. what is 'good' to someone may be 'poor' to someone else, therefore there is a level of subjectivity that is not acknowledged.

Furthermore, respondents may be forgetful or not thinking within the full context of the situation – i.e. stated that they performed two hours of vigorous activity when it was an hour of vigorous with an hour of moderate activity.

Delimitations

In order to ascertain the most accurate responses from the subjects, it may be in the researcher's best interest to provide an example of activities that are moderate to vigorous activity-i.e. moderate activity such as walking and running for vigorous activity. More importantly it will behoove the research if the researcher also explains each sedentary behavior within the Sedentary Behavior Questionnaire.

CHAPTER 2

LITERATURE REVIEW

The purpose of Rosenberg, Norman, Wagner, Patrick, Calfas, and Sallis, (2010) study was to test the reliability and validity measure of sedentary behavior questionnaire (SBQ) for use in overweight adults. To assure further validity, SBQ was checked against other known self-reported validated measures of sedentary behaviors. Additionally, body mass index was included as a construct validity measure, as it has been shown to be related to sedentary behavior (Rosenberg, Norman, Wagner, Patrick, Calfas, and Sallis, 2010). Participants in the study were 401 overweight women for random controlled trial (RCT) one and the second RCT had 441 men. Additionally, the researchers included a two week test-retest reliability study with 49 randomly selected adults.

The Sedentary Behavior Questionnaire assess nine sedentary behaviors that include, watching television, playing computer/video games, sitting while listening to music, sitting and talking on the phone, doing paperwork or office work, sitting and reading, playing a musical instrument, doing arts and crafts, sitting and driving/riding in a car, bus, or train. In addition, the nine items in the SBQ were separated for weekday and weekend usage. And each domain is separated into time frames, giving participants the opportunity to select none, less than 15 minutes, 30 minutes, one hour, two hours, three hours, four hours, five hours, or six or more hours.

The two week test-retest reliability sample demonstrated moderate to excellent reliability for weekdays (range =.64-.90) and weekend days (range=.51-.93) (Rosenberg, Norman, Wagner, Patrick, Calfas, and Sallis, 2010). As for the validity, there were no

significant relationships between the SBQ and accelerometer counts or total physical activity. However, the IPAQ related to the total SBQ scores, along with BMI, which showed a significant relationship between television, weekday, and total SBQ score. Buckworth and Nigg (2004) analyzed the relationship between exercise, physical activity, and sedentary behaviors in a sample of college students. Within this study, the researchers also analysis the differences between gender and age as research has shown that these are significant determents of physical activity in college students. The researchers hypothesized that men would be more active than women; older students would engage in more studying and computer use and physical activities than younger students; significant positive relationships among different measures of exercise and physical activity but not among different sedentary activities were likely, and television watching but not studying or computer use would be negatively correlated with exercise (Buckworth & Nigg, 2004).

Participants from the study were selected from 10 classes that were used to test the effect of curriculum modification on mediators of behavior change and exercise adherence. The classes selected for the study were elective condition activity courses. That consisted of a 50-minute lecture and 45-minute exercise lab 3 times a week. Majority of the students enrolled in aerobic dance (44%) and weight training (39%). Each participant received a questionnaire relating to their exercise behavior, physical activity history, and sedentary behavior. Questions pertaining to exercise behavior were answered using a 7-day activity recall about moderate-vigorous exercise, stretching, and strengthening and/or toning muscle. An additional three questions were asked by the researchers, 1) typical exercise duration; 2) frequency in days per week; and 3) length of

time months exercising at this level (Buckworth & Nigg, 2004). Physical activity history was recorded using the CARDIA Physical Activity History Questionnaire that measure participation levels in moderate intensity and vigorous intensity activities over the past 12 months. Sedentary behavior participation was measure using number of hours spent watching television and/or video games, studying and using the computer (Buckworth & Nigg, 2004).

Results from the study indicated that student were typically active at the onset of a course, and exercised on a consistent basis for nearly 2 years, allowing for some insight into a physically active student sedentary habit.

Troiano et al (2007), compiled the results from National Health and Nutritional Examination Survey (NHANES). Through this survey, physical activity data was collected from 7176 participants wearing Actigraph accelerometers. To perform the survey, mobile examinations centers were mobilized and fifteen geographical locations were selected, but not listed. Ages of participants ranged from six to sixty plus (Troiano et al, 2007).

Data was collected only if ten active hours of activity was evident. This was determined by sixty minute intervals of continuous activity. Non- wear time was determined by sixty minutes of inactivity as determined by the accelerometer. As a result, 4876 participants had four usable days and 6329 participants with one or more usable days. Physical activity was calculated by the following measures, average count per minute, count thresholds and adherence to exercising recommendations. The group with the highest adherence of wearing the accelerometer was sixty or older as evident by an eighty-four percent compliance rate. Also, it became apparent that the amount of physical

activity decreased as age increased. This is noticeable in the sixteen to nineteen age group, when physical activity decreased by half from an hour a day to thirty-three minutes a day (Troian et al, 2007).

Through NHANES, there was a noticeable difference between physical activity and duration and intensity of activity between age groups and gender. There was also a difference in perceived physical activity compared to actual results. According to Torinano et al (2007), only 25-33% of the populations are physically active for thirty minutes or more. As a result, it is suggested that careful considerations need to be prevalent when assessing individual's perceptions of physical activity.

Koezuka, Koo, Allison, Adlaf, Dwedyer, Faulkner, & Goodmen (2006) evaluated the results from the Canadian Community Health Survey and the relationship between sedentary activities and physical inactivity among adolescents. The populations sample includes 7982 youth between the ages of 12-19 with 4034 being males and 3948 being females. To evaluate the relationship between physical activity and sedentary activities, each subject received a "common" questionnaire along with and optional questionnaire on select topics chosen by each health location (Koezuka, et al, 2006).

The researchers defined sedentary activities as the amount of time spent during leisure on computer, video game, television viewing, and reading (Koezuka, et al, 2006). However, times spent on these activities at school were excluded. Time spent in these categories were measured by the following scale, 1) none, 2) more than zero to less than six hours, 3) six to less than 15 hours, and 4) 15 hours or more (Koezuka, et al 2006). Dependent variable for the study was physical inactivity and measured by a physical inactivity questionnaire. Additionally, subjects' energy levels were measured to determine

metabolic equivalents. Moreover, subjects who spent less than three kilocalories per kilogram of body weight were considered inactive and those spending more than three kilocalories were considered active. Control variables were determined by demographic information, such as BMI and immigration status (Koezuka et al 2006).

Results from the Canadian health surveyed showed that 67% of females and 50% of males were classified as inactive. A large amount of males' time is spent on computers, video games, and television. However, television viewing for Canadian adolescents is significantly lower than American children (Koezuka et al, 2006). Additionally, television viewing was a significant factor for physical inactivity for males and female adolescents. Stats also show that those who played video games for less than five hours were more likely to be active and as reading time increased (for females), so did physical activity (Koezuka et al, 2006). Age was also a strong indicator for physical activity level.

A number of studies have been conducted on the Stages of Exercise Behavior with Marcus and Simkin (1993) study being the foundational framework. The stages of change were originally applied to smoking and other addictive behaviors. This model was designed to take into account an individual's desire/or intention to change activity or behavior. As such, Marcus and Simkin applied this stage of change model to measure stages of exercise and level of activity of individuals at each stage, along with the validity of such a tool (Marcus & Simkin, 1993).

Subjects for the study were recruited through a wellness worksite program on health risk and smoke cessation. Two-hundred and thirty-five subjects were recruited for the study from two worksites. Subjects were placed into 1 of the 5 stages per their

response. The 5 categories include precomteplation, contemplation, preparation, action, and maintenance (Marcus & Simkin, 1993). Precomteplation include subject who did not or did not plan to exercise. Comtemplation included subjects who intended to exercise in the next 6 months. Preparation included subjects who exercised regularly for less than 6 months. Action included subjects who have exercised regularly for 6 months and maintenance included subjects who have exercised regularly for longer than 6 months. This instrument has a Kappa index of reliability of .78 over a 2 week period (Marcus & Simkin, 1993).

The other instrument used was the 7-day Physical Activity Recall questionnaire or PAR (Marcus & Simkin, 1993). The PAR is a self-administered questionnaire that measures physical activity over a 7-day period. With the PAR, subjects are asked to describe in detail their levels of activity in terms of moderate, hard, and very hard intensity (Marcus & Simkin, 1993). Marcus and Simkin (1993), also note that the PAR has been validated in a number of worksite-based samples and has been found to be significantly associated with energy expenditure in manual labor occupations. Additionally, the PAR has a Test-retest reliability for light ($r = 0.65$), hard ($r = 0.31$), hard activity ($r = 0.61$), and hours of sleep ($r = 0.74$) (Marcus & Simkin, 1993). However, for the present study, the researchers combined hard and hard intensity into vigorous activity on the PAR.

To interpret the data collected, the researchers collapsed the 5 stages of change into 3 stages, precontemplation/contemplation, preparation and action with maintenance. ANOVA was performed to determine the relationship between the stages of change and time spent in moderate and vigorous activity (Marcu & Simkin, 1993). Stage of change

was the independent variable. Test revealed a significant relationship between group effects for total minutes of vigorous activity in the past week (Marcus & Simkin, 1993). The researchers also point out that the results from the study show a significant difference between stage of behavior and self-reported physical activity.

Leslie, Johnson-Kozlow, Sallis., Owen, & Bauman, (2003) conducted a study to measure the reliability of the Stages of Change in two populations samples (Australian & American young adults) for moderate and vigorous physical activity. The researchers defined moderate intensity as perform 30 minutes of physical activity five days a week, such as walking, vacuuming, gardening, or housework. Vigorous activity was defined as performing an activity three days a week for minutes, such as biking, dancing, weight lifting and running. Additionally, both sample populations received the Stage of Change questionnaire.

Population sample one consisted of 105 undergraduate students from a southern California university, with a mean age of 20.6. Each subject received a physical activity questionnaire twice and was separated by one week interval. Population sample two consisted of 123 Australian undergraduate students, with a mean age of 22.3. Sample population two also received the physical activity survey (Leslie, Johnson-Kozlow, Sallis., Owen, & Bauman, 2003).

Results from both samples were very similar for both categories. For moderate intensity, sample one had kappa coefficient of 0.50 and sample two had 0.45. Both samples fall on the lower end of the "fair to excellent" range. Kappa index for vigorous physical activity was 0.76 and 0.75 for sample one and two, respectively (Leslie, Johnson-Kozlow, Sallis., Owen, & Bauman, 2003).

Researchers point out that the low reliability score of moderate physical activity is due to the subject inability to quantify or define such actions, where as intense activity is more readily definable. What appears to be an issue is that young adults do not see the need to plan or set time aside for moderate activities unlike for vigorous activity because the perception is that moderate activity is not "exercise" (Leslie, Johnson-Kozlow, Sallis., Owen, & Bauman, 2003). This is believed to be caused by the fact that young male adults believe that physical activity or exercise must be more vigorous than activities such as brisk walking. Additionally, the researchers state that besides the measurement difficulties, amending stage of change items to reflect moderate-intensity activities as a potential use in public health interventions (Leslie, Johnson-Kozlow, Sallis., Owen, & Bauman, 2003).

Wallace and Buckworth (2003) conducted a study on the longitudinal shifts in exercise stages of change in college students. Wallace and Buckworth objective was to examine the relationship of exercise self-efficacy, social support, sedentary behavior, and longitudinal shifts of exercise stages of change without intervention. One-hundred and seventy-three students completed the questionnaire at baseline and follow up. Students were selected from a large mid-western university. Sixty-four percent of the subjects were female and 35.6% were male and all five classes were fairly distributed, 22% freshmen, 22% sophomore, 12% junior, and 17% senior (Wallace & Buckworth, 2003).

Reliable and validated questionnaires were used to measure the subjects responses. These questionnaires evaluated demographic characteristics, stage of exercise behavior change, exercise self-efficacy, social support, exercise behavior pattern, and sedentary behavior (Wallace & Buckworth, 2003). Once the researchers collected data

at baseline and follow-up, the subjects were placed into four categories determined by their stage of exercise. These categories are stable sedentary (precomtemplative & contemplative), stable active (action & maintenance at baseline and follow up), adopters (moved up at least one stage), and relapsers (moved at least one stage from maintenance to precomtemplative).

According to the study, the results indicate that progressive and regressive shifts in stage of exercise behavior change occur overtime without intervention efforts. Furthermore no changes were observed psychosocial variables and exercise behavior for stable sedentary and stable active and other groups (Wallace & Buckworth, 2003). It was also noted that those who relapse (went down a stage) experienced a decrease in exercise self-efficacy and social support; suggesting that social support is an important factor for maintenance of exercise.

Wallace, Buckworth, Kirby, and Sherman (2000), studied the characteristics of exercise behavior among college students. The specific purpose of the investigation was to examine personal, behavioral, and environmental characteristics associated with different stage of exercise behavior (Wallace, Buckworth, Kirby, and Sherman, 2000). More importantly, the researchers wanted to know the distribution of students in the five exercise stages of change. This was done to predict the factors affecting a student's stage of change. Researchers also utilized the social cognitive theory as a way to further identify and categorize the students exercise behavior.

The studied included 937 randomly selected individuals enrolled at a large Midwestern university, between the ages of 17-24 years old (Wallace, Buckworth, Kirby, and Sherman, 2000). Each participant received the questionnaires through the postal

service or via campus mail. Each package included eight questionnaires amounting to 78-items. These questionnaires were, Stage of Exercise Behavior Change, demographic information, exercise self-efficacy, nonexercise VO_2Max estimation, enrollment in physical education and/or intra/extramural sports during the preceding year, sedentary behavior pattern, and social support for exercise behavior.

According to the study results 52% of students reported being inactive (precomtemplative/contemplation and preparation), additionally, 31% of the respondents reported being in the maintenance stage (exercising for six months or longer). Furthermore, there was a significant difference between male and female stage of change. More males were in the maintenance group compare to females (31% males, 25% females). Additionally, nonexercise VO_2Max estimation, exercise self-efficacy, and physical activity history during the previous 12 months proved to be significant in determining exercise behavior stage (Wallace, Buckworth, Kirby, and Sherman, 2000). Moreover, exercise self-efficacy is a critical variable in determining exercise stage of behavior and the results from this study also aligns with several prior studies. Furthermore, female participants moved from one stage to another with the benefits of social support.

The results of this study suggest that certain physical activity interventions need to take place in both genders. Social support was a significant variable for both groups and as such it important to develop a curriculum that nurtures this area. More importantly, the college environment may need to be altered to promote such interventions and there appears to be a greater need for quality intervention in the female populations. As the researcher suggests that greater effort must occur to improve the

amount of time females participate in vigorous physical activity (Wallace, Buckworth, Kirby, and Sherman, 2000). Finally, interventions should target student sedentary behavior as the study showed that more than half the students were defined as physically inactive.

CHAPTER 3

METHODS

Introduction

The purpose of the investigation was to analyze the relationship of sedentary behaviors and physical activity levels in relation to class standing, at Eastern Kentucky University. Sedentary behavior was assessed using the Sedentary Behavior Questionnaire (Rosenberg, Norman, Wagner, Patrick, Calfas, & Sallis, 2010) along with the International Physical Activity Questionnaire (Craig, 2003). Moreover, the researchers examined the relationship between sedentary behavior physical activity in relation to class rank i.e. freshmen to seniors and graduate students. The study included the following procedural steps: instrumentation (passing out questionnaires), data collection, and data analysis. The study was approved by the Eastern Kentucky University Institutional Review Board.

Participants

Three Hundred and Fourteen male and female participants between the ages of 18-40 years old were recruited through Eastern Kentucky University's Exercise & Sport Science and health majors during the Fall 2014 semester. Student classifications are the following: Freshmen 0-29 hours, Sophomores 30-59 hours, Juniors 60-89 hours, Seniors 90 or more hours, and Graduate students. After indicating interest in the study, participants were asked a series of questions. These questions related to demographic information such as age, race, sex, class rank and non-traditional student status.

Participants who were not fulltime (less than 12 credit hours & less than 9 credit hours for graduate students) were excluded from the study. Approximately 35-85 participants were recruited from each class standing. Furthermore, each participant completed the Sedentary Behavior Questionnaire and the International Physical Activity Questionnaire

Instruments: Reliability and Validity

Sedentary behavior is commonly referred to as an engagement of activity that requires expending low amounts of energy, > 1.5 METS, such as watching television (Sedentary Behavior Research Network, 2014). The Sedentary Behavior Questionnaire (SBQ) has proved to be a valid and reliable instrument for measuring sedentary behavior (Norman, Schmid, Sallis, Caifas, & Patrick, 2005; Rosenberg, Norman, Wagner, Patrick, Calfas, & Sallis, 2010). The SBQ has a test-retest reliability of 0.51-0.93 for weekends and 0.64-0.90 for weekdays, and validity of 0.84 for weekdays and 0.77 for weekend days, along with a significant relationship to the International Physical Activity Questionnaire in relation to men (Rosenberg, Norman, Wagner, Patrick, Calfas, & Sallis, 2010). Moreover, the SBQ assess nine sedentary behaviors that include watching television, playing computer/video games, sitting while listening to music, sitting and talking on the phone, doing paperwork or office work, sitting and reading, playing a musical instrument, doing arts and crafts, sitting and driving/riding in a car, bus, or train. In addition, the nine items in the SBQ were separated for weekday and weekend usage. Furthermore, each domain is separated into time frames, giving participants the opportunity to select none, less than 15 minutes, 30 minutes, one hour, two hours, three hours, four hours, five hours, or six or more hours.

To measure physical activity, each participant was given the short form of the International Physical Activity Questionnaire (IPAQ) (Cocker et al, 2009; Tully & Margaret, 2011). The short form IPAQ contains four activity domains that include, 1) vigorous activity, 2) moderate physical activity, 3) walking 4) and time spent sitting. The IPAQ is internationally recognized as a valid and reliable instrument for assessing PA (Cocker et al, 2009).

Procedures

The researcher emailed instructors in the Exercise & Sport Science and health majors at Eastern Kentucky University during the first eight weeks of the fall semester of 2014. Emails were sent to the instructors in order to ascertain the recruitment of their classes. Instructors, who agreed, were sent a brief email about the study, in addition to the researcher meeting with the instructor in person. The email contained information on the procedures and data collection protocol, along with copies of the questionnaires.

Before the questionnaires were distributed, each subject received an informed consent form as the cover sheet and asked to complete it before beginning the study. The informed consent form assured the participants of anonymity and confidentiality. Furthermore, the subjects were informed of the purpose of the study, content of the questionnaires, and directions for completing the questionnaires. In addition to the questionnaires, demographic information was collected from all subjects.

The SBQ and IPAQ were given to all subjects and completed on the spot. In total, it took approximately 20 minutes to complete. Once completed, the principal investigator collected the questionnaires and placed each one in a sealed envelope.

Statistical Analysis

Data was analyzed using Statistical Package for the Social Sciences for Windows, version 21 (SPSS Inc. 2012) and descriptive statistics will used to compute demographic variables. Physical activity and sedentary behaviors will be analyzed by using Analyses of Variance (ANOVA) and multiple regressions with Tukey's Honestly significant post hoc comparisons to analyze the differences by class standing and sex. Significance was set at $p<0.05$

CHAPTER 4

MANUSCRIPT

Introduction

Despite the wealth of knowledge on the importance of being physically active, the majority of Americans live a sedentary lifestyle (Calfas et al., 2000). Typically this sedentary behavior emerges between the ages of 16 to 19, where moderate and vigorous activity decrease or stops (Trost, Pate, Sallis, et al. 2002; Troiano et al, 2007). This decrease in physical activity during high school leads to a greater susceptibility to weight gain while attending college (Lloyd-Richardson, Baily, Fava, & Tobacco Etiology Research Network, 2009). According to Crombie, Llich, Dutton, Panton, & Abood (2009) this occurs because of increased demands placed on the university student, which could otherwise be used for being physically active. Moreover, a recent survey by the National College Health Association (2010) indicates that only 52.3% of male and 43.6% of female college students met the recommended daily amount of physical activity on at least three of the past seven days. Additionally, the American College of Sports Medicine recommends 30 minutes of moderate physical activity five days a week (Haskell et al, 2007). This decrease in physical activity is a serious and important health matter that needs further research, as many health behaviors that carry over into adulthood are established during late adolescence (US Dept Health and Human Services: Healthy people 2010, 2000; Tammelin, Nayha, Laitinen, et al. 2003).

Although a number of national samples have described physical activity and exercise in various populations (National College Health Risk Behavior Survey, 1995; Canadian Community Health Survey, 2006; Troiano, et al. 2007; National College Health Assessment: 2010), there is limited research examining student sedentary behavior, physical activity and exercise stages of change. A lack of physical activity has been associated with poor physiological wellbeing, such as increased risk of obesity, high blood pressure, heart disease, and type II diabetes (Haskell et al, 2007). Research is now showing that there is need to better understand sedentary behavior in order to effectively impact physical activity (Hu, Li, Colditz, Willett, & Manson 2003). Sedentary behaviors such as television watching have been associated with obesity in children (Anderson, Crespo, Bartlett, Cheskin, & Pratt, 1998) and adults (Salmon, Bauman, Crawford, Timperio, & Owen, 2000).

However, one of the more popular hypotheses explaining the differences in sedentary behaviors and physical activity is the displacement hypothesis (Buckworth & Nigg, 2004). This hypothesis suggest that the more time an individual devotes to a sedentary behavior, the less time he or she will devote to physical activity (Muts, Roberts, & Vuuren, 1993). This hypothesis also states that in order for this to occur, a new activity must be introduced to force out an old activity or behavior (Buckworth & Nigg, 2004). Over the past few decades, screen time has increased, while at the same time physical activity has decreased, contributing to an increase in obesity, particularly in youth (Lobstein, Baur, & Uauy, 2004; Wareham, Sluijs, & Ekelund, 2005; Jackson, Djafarian, Stewart, & Speakman, 2009). If physical activity is replaced by sedentary

behaviors such as screen time, the relationship may be explained by the displacement theory.

A meta-analysis by Marshall et al. (2004) showed that sedentary behaviors are related to be being physically inactive and is significantly associated with increased fatness. However, Prochaska, Sallis, Sarkin, and Calfas (2000) showed that television watching was not strongly related to 14 physical activity variables, but was correlated to physiological indicators of fitness, such as heart rate. In addition to watching television, there are a number of sedentary behaviors that compete with physical activity, such as computer use, reading, studying, and socializing that impact fitness levels. Likewise, a study conducted with Australian adults showed that those who spent significant amounts of time on the computer were most likely to be inactive (Fotheringham, Wonnacott, & Owen, 2000). Conversely, the influences of sedentary behavior on physical activity levels are not yet completely understood and require further investigation.

Therefore, the purpose of this study was to analyze the relationship of sedentary behavior and physical activity in relation to class standing with university aged adults. Also, a segment of the data will be analyzed based on gender differences, as research has shown this to have a significant impact on physical activities and barriers to physical activity (Wallace & Buckworth, 2001; Buckworth & Nigg, 2004), such as television and computer use (Buckworth & Nigg, 2004). The research hypotheses are as follows: 1) computer use will increase according to class standing; 2) television viewing will increase and physical activity levels will decrease; 3) increase in class rank will relate to a decrease in physical activity and increase in sedentary time; 4) time spent in sedentary

behaviors will decrease for the weekend compared to week day; 5) students will not meet the daily recommended amounts of physical activity; 6) and males will be more physically active than females.

Methods

Sedentary behavior was assessed using the Sedentary Behavior Questionnaire (Rosenberg, Norman, Wagner, Patrick, Calfas, & Sallis, 2010) along with the International Physical Activity Questionnaire (Craig, 2003). Moreover, the researchers examined the relationship between sedentary behavior and class rank i.e. freshmen to seniors and graduate students. The study included the following procedural steps: instrumentation (passing out questionnaires), data collection, and data analysis. The study was approved by the Eastern Kentucky University Institutional Review Board.

Three Hundred and Fourteen male and female participants between the ages of 18-40 years old were recruited through Eastern Kentucky University's Exercise & Sport Science and health majors during the Fall 2014 semester. Student classifications are the following: freshmen 0-29 hours, sophomores 30-59 hours, juniors 60-89 hours, seniors 90 or more hours, and graduate students. After indicating interest in the study, participants were asked a series of questions. These questions relate to demographic information such as age, race, sex, class rank and non-traditional student status. Participants who were not fulltime (less than 12 credit hours & less than 9 credit hours for graduate students) were excluded from the study. Each participant completed a Sedentary Behavior Questionnaire (SBQ) and the International Physical Activity Questionnaire (IPAQ).

Sedentary behavior is commonly referred to as an engagement of activity that requires expending low amounts of energy, > 1.5 METS, such as watching television (Sedentary Behavior Research Network, 2014). The Sedentary Behavior Questionnaire (SBQ) has proved to be a valid and reliable instrument for measuring sedentary behavior (Norman, Schmid, Sallis, Caifas, & Patrick, 2005; Rosenberg, Norman, Wagner, Patrick, Calfas, & Sallis, 2010). The SBQ has a test-retest reliability of 0.51-0.93 for weekends and 0.64-0.90 for weekdays, and validity of 0.84 for weekdays and 0.77 for weekend days, along with a significant relationship to the International Physical Activity Questionnaire in relation to men (Rosenberg, Norman, Wagner, Patrick, Calfas, & Sallis, 2010). Moreover, the SBQ assessed nine sedentary behaviors that include watching television, playing computer/video games, sitting while listening to music, sitting and talking on the phone, doing paperwork or office work, sitting and reading, playing a musical instrument, doing arts and crafts, sitting and driving/riding in a car, bus, or train. In addition, the nine items in the SBQ are separated for weekday and weekend usage. Each domain is separated into time frames, giving participants the opportunity to select none, less than 15 minutes, 30 minutes, one hour, two hours, three hours, four hours, five hours, or six or more hours.

To measure physical activity, each participant was given the short form of the IPAQ (Cocker et al, 2009; Tully & Margaret, 2011). The short form IPAQ contains four activity domains that include, 1) vigorous activity, 2) moderate physical activity, 3) walking 4) and time spent sitting. The IPAQ is internationally recognized as a valid and reliable instrument for assessing PA (Cocker et al, 2009).

The researcher emailed instructors in the Exercise & Sport Science and Public Health Departments at Eastern Kentucky University during the first eight weeks of the fall semester of 2014. Emails were sent to the instructors in order to ascertain the recruitment of their classes. Instructors who agreed were sent a brief email about the study, in addition to the researcher meeting with the instructor in person. The email contained information on the procedures and data collection protocol, along with copies of the questionnaires. Additionally, participants received an inform consent form explaining the study and procedures. In addition to the questionnaires, demographic information was also collected.

Statistical Analyses

Data was analyzed using Statistical Package for the Social Sciences for Windows, version 21 (SPSS Inc. 2012) and descriptive statistics were used to compute demographic variables. Physical activity and sedentary behaviors were analyzed using Analyses of Variance (ANOVA) and multiple regressions with Tukey's Honestly significant post hoc comparisons to analyze the differences by class standing and sex. Significance was set at $p<0.05$.

Results

Descriptive statistics for each sedentary behavior questionnaire item as well as weekday, and total hours spent in sedentary behaviors are in Table 1 (Appendix A). On average students across all class standing spent almost 37 hours engaged in sedentary behaviors during a normal five-day week, mostly television (7.3 hr) and paperwork (10.7 hr). Moreover, statistical significance was found between class standing for computer

use, paperwork, and transportation for weekday sedentary behaviors. Significance for computer use was only observed between graduate students (1.0 hr) and sophomores (4.2 hr). Additionally, significance was observed between graduate students and all class standings for paperwork (graduate students mean= 15.4 hours per week) compared with freshmen, sophomore, junior, and senior; $F(4, 314)=6.05$, $P=.00$. Transportation results showed significant difference for freshmen, verses three other classes $F(4, 314)=4.43$, $P=.002$. Freshmen had 2.4 hours verses juniors with 4.7 hours; $P= .046$ and seniors 4.4 hours $P=.001$.

Sedentary behavior descriptive statistics for the weekend day by class rank are in Table 2, including total hours spent in sedentary behaviors. Students across all standings on average spent 15 hours engaged in sedentary behaviors during a normal two day weekend. The highest ranking of these sedentary behaviors included television (4.3 hr) and paperwork (2.8 hr). Computer use was significantly different for graduate students (0.1 hr) compared to both freshmen (1.9 hr);$P=.001$ and sophomores (2.4hr); $P=.00$; $F(4, 289)=5.68$, $P=.00$. In addition, results showed significance for sophomores (3.4hr) compared to seniors (1.7hr);$P=.008$, and graduate students (1.4);$P=.004$ for music. Also, results showed a significant difference between sophomores and graduate student on amount of reading performed; $P=.049$. However, unlike the weekday, no significance was observed between class standing for paperwork.

Results showed significant differences between men and women on variables indicating total sedentary behavior hours during the weekday; $P=.009$, descriptive stats can be found in Table 3. On average men spent 4.6 hours on the computer compared to women at 1.4 hours. Moreover, females reported more time spent doing paper work than

men, 12.6 to 8.6 hr, respectively. Significance was noted for phone use; *P*=.004, reading; *P*=.004, and art/crafts; *P*=.021, between male and females. Significance was also reported for weekend day within the same variables, computer use, phone use, paperwork, reading, and arts/crafts. Again males reported more time spent on computer and females reported more time spent on paperwork compared to the opposite gender. Weekend day sedentary behavior descriptive statistics can be seen in Table 4.

There were no observed significance differences between class rank for total vigorous activity, total moderate activity, walking total, or sitting total. However, students across all class standing spent 5.1 hours in vigorous activity and 5.1 hours in moderate activity during the week. Descriptive statistics for total vigorous, total moderate activity, walking, and setting are represented in Table 5. Significance was noted between gender for total vigorous activity with men performing 7.0 hours compared to 3.2 hours for women per week. Moreover, students across all class standings spent on average three days per week performing vigorous physical activity and 3.3 days performing moderate activity.

Discussion

In this study, we analyzed the relationship of sedentary behaviors and physical activity levels of university students in relation to class standing and gender. To our knowledge this is one of few studies to looking at these specific variables in relation to class standing. Therefore the primary purpose of this study was to establish descriptive statistics in regards to sedentary behaviors and physical activity according to class standing. University students spent on average 52% of waking hours, or 7.3 hour/day in sedentary behaviors, which is slightly lower than time reported by Matthews, et al,

(2007). Contrary to our hypothesis, computer use did not increase as class standing increased; which is dissimilar to Buckworth and Nigg's study. Instead computer use showed a steady decrease from sophomore year to graduate year. Previous studies using cross-sectional questionnaires have reports on computer use have varied widely from less than three hours to more than 11 (Fortheringham, Wonnacott, & Owen, 2000; Anderson, 2001; Bureau of Labor Statistics, 2014). More importantly this could be due to increase in paperwork load, which demonstrated the opposite reaction; paperwork instead showed a steady increase from sophomore year (7.7hr/week) to graduate year (15.3hr/week). These associations may reflect the different academics demands placed on the student's class standing.

Remarkably the author found no significant difference in television viewing time between class standing (7.3hr/week average). Previous literature has shown television impacts physical activity levels or had higher reports of viewing time than we reported (Robinson, 1999; Salmon, Bauman, Crawford, Timperio, & Owen, 2000; Buckworth & Nigg, 2004; Nelson, 2007; Kordela 2008). This of course pales in comparison to Nielsen Media Research Report 2004-2005, which stated that students spent 24.3 hours per week watching television. Unlike our prediction, sedentary time increased for weekend sedentary behaviors. With students spending on average 7.6 hours in leisure activities compared to 7.3 hours during the week day. Moreover there is a noticeable difference for sophomores who spent 7.3 hours during a week day compared to 8.7 hours during a weekend day. More importantly, each class standing showed an increase in sedentary time except graduate students; which decreased from 7.8 hours/day

to 6.7 hours/day. As hypothesized, men spent the least amount of time in sedentary behaviors than women.

On average during a normal five day week, men spent 35 hours in leisure activities compared to 39 hours for women. Sedentary hours reported are slightly higher than reports from Buckworth and Nigg (2004) and similar to Matthews, et al (2007), however are noticeably less than the general population studies (Salmon, Bauman, Crawford, Timperio, & Owen, 2000; Rosenberg, Norman, Wagner, Patrick, Calfas, & Sallis, 2010; Bureau of Labor Statistics, 2014). Additionally, association between gender and computer use reflect the literature; men spent more time on the computer than women during the week and weekend days (Fortheringham, Wonnacott, & Owen, 2000; Koezuka, Koo, Allsion, Adlaf, Dwyer, Faulkner, & Goodman, 2006; Rosenberg, Norman, Wagner, Patrick, Calfas, & Sallis, 2010; Bureau of Labor Statistics, 2014). Furthermore, computer use reported by our study is significantly lower, as a whole than reported by Fortheringham, Wonnacott, and Owen (2000) and appears to be a none factor for impeding physical activity as reported by other studies (Troiano, et al, 2007; Koezuka, Koo, Allsion, Adlaf, Dwyer, Faulkner, & Goodman, 2006). Moreover women reported higher levels of paperwork and reading than men; which are similar to Bureau of Labor Statistics (2014).

Physical activity was assessed using a standard questionnaire mythology with an array of questions that have been validated in prior studies (Craig et al, 2003; Brown, Bauman, Chey, Trost & Mummery 2004; Ekelund, et al., 2006; Hagstromer, Oja, & Sjostrom, 2006). Unlike our hypothesis, students on average meet the weekly recommendation of physical activity per week as stated by the American Heart

Association (Haskell, et al, 2007) and Healthy People 2010 (US Dept Health and Human Services, 2000). According to the American Heart Association, individuals should perform a minimum of 30 minutes on five days each week (2.5hr/week) or vigorous physical activity for a minimum of 20 minutes on three days each week (1hr/week).

More importantly the author reported 5.1 hours/week for moderate activities and 5.1 hours for vigorous activities per week. Physical activity levels reported by our study are higher than reports by Buckworth and Nigg (2004) and Huang, Harris, Lee, Nazir, Born and Kaur (2003), which reported 3.4 days and 2.8 days, respectively. Our study reported students performing vigorous activity 2.9 days per week and moderate activity for 3.3 days per week on average. Furthermore, the higher reported amounts of physical activity may be due to the population surveyed. Moreover, juniors reported the highest level of physical activity in all categories measured, but reported the lowest amount of time spent in sedentary behaviors, more specifically television viewing and computer use. Differences in physical activity according to gender are consistent with prior literature in multiple cohort studies, which have reported that males are more active than females (Kruger, 2007 & CDC Prevalence of Regular Physical Activity among Adult, 2001 & 2005).

Limitation

Limitation to this study is the use of time recall surveys for both sedentary behaviors and physical activity. None the less, these surveys have been shown to be reliable and valid within these populations and age cohorts (Craig et al., 2003; Rosenberg, Norman, Wagner, Patrick, Calfas, & Sallis, 2010). More specifically, the SBQ does not differentiate screen time for computer use and paperwork is generalized

statement. Additionally, some cross over from one sedentary behavior to another is expected and inevitable. Also, sample size for sophomores may indicate the difference in sedentary behavior when compared to other class standing. Due to the sample size within this population

Conclusion

While limited, our findings from the study supports the idea that certain sedentary behaviors change overtime according to class standing. Moreover, college students perceive certain sedentary behaviors with differing levels of importance according to recreational or obligatory tasks. Which introduces the notion of constructive (eg, studying for an exam or homework) verses mindless sedentary behaviors (eg, television and video games).Future research should focus on the development of a sedentary behavior questionnaire that specifically targets the university student. More importantly interventions should transition year from year just as the students' transition in relation to the new demands placed on the university students. Since a large portion of time is spent doing paperwork/computer use for graduate students, it may be beneficial to research the impacts of a web-based physical activity program. When designing interventions, specialist should considered ways to make physical activity more accessible and more rewarding than sedentary behaviors.

Consequently majority of physical activity interventions take place within the freshmen/sophomore years of attending a university. Typically most university require their students to take basic health and wellness course that include an "exercise" lab one day week. This may be a reason why a decline in physical activity is not noticeable till the junior/senior year. Subsequently course offerings in the area of physical activity in the

work place/class during this time offer an area of consideration. Overall the results from this study show that a shift in behavior is occurring within this population. With students performing at or above the recommended levels of physical activity and less sedentary time previously reported.

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APPENDIX A:

Tables

Table A-1. Mean Hours/Week Day and Standard Deviations (SD) for All Sedentary Behavior Questionnaire Items and Summary Score for Class Standing

	Freshmen	Sophomores	Juniors	Seniors	Graduate Student
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
TV	7.7 (5.7)	7.3 (6.0)	7.5 (5.2)	6.9 (5.6)	6.9 (4.8)
Playing computer or video games	3.3 (5.5)	4.2 (6.0)	3.1 (4.9)	2.9 (4.9)	1.0 (3.2)
Sit listen to music	6.8 (8.7)	7.7 (7.9)	5.1 (5.1)	4.5 (5.7)	4.5 (7.0)
Talk on the phone	3.0 (3.6)	2.4 (2.8)	3.1 (4.1)	2.2 (2.8)	2.3 (2.0)
Paperwork/Computer	10.5 (7.8)	7.7 (8.1)	9.2 (8.0)	10.8 (7.3)	15.3 (9.1)
Reading	2.1 (3.4)	1.9 (4.0)	1.7 (2.9)	2.2 (3.2)	3.0 (3.2)
Playing musical instrument	0.5 (3.4)	0.4 (1.7)	0.1 (0.7)	0.4 (2.4)	0.1 (0.7)
Arts and Crafts	0.2 (0.7)	0.4 (1.7)	0.2 (0.8)	0.7 (3.3)	1.2 (3.0)
Transportation	2.4 (3.3)	4.2 (5.4)	4.7 (6.0)	5.4 (4.9)	4.4 (3.4)
Total sedentary hours/week	37.0 (19.8)	36.6 (22.5)	35.1 (22.90)	36.6 (18.9)	39.2 (19.8)
Total weekday (hours/day)	7.4 (3.9)	7.3 (4.5)	7.0 (4.5)	7.3 (3.7)	7.8 (3.9)
Total weekend (hours/day)	7.4 (3.6)	8.7 (5.1)	7.7 (4.7)	7.7 (5.3)	6.7 (3.5)

Table A-2. Mean Hours/Weekend Day and Standard Deviations (SD) for All Sedentary Behavior Questionnaire Items and Summary Score for Class Standing

	Freshmen	Sophomores	Juniors	Seniors	Graduate Student
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
TV	3.8 (2.8)	5.0 (3.4)	4.5 (2.9)	4.3 (3.1)	4.2 (2.8)
Playing computer or video games	1.9 (2.9)	2.4 (3.2)	1.3 (2.3)	1.2 (2.2)	0.1 (0.4)
Sit listen to music	2.5 (2.9)	3.4 (3.6)	1.9 (2.3)	1.7 (2.2)	1.4 (1.8)
Talk on the phone	1.2 (1.7)	1.3 (2.0)	1.2 (1.4)	1.1 (1.7)	0.9 (0.9)
Paperwork/Computer	2.6 (2.7)	2.2 (2.4)	3.0 (3.0)	3.0 (3.0)	3.3 (3.2)
Reading	0.6 (1.0)	0.2 (0.5)	0.4 (0.7)	0.8 (1.6)	1.0 (1.2)
Playing musical instrument	0.1 (0.7)	0.2 (0.9)	0.1 (0.7)	0.2 (1.2)	0.1 (0.8)
Arts and Crafts	0.1 (0.6)	0.3 (1.3)	0.2 (0.8)	0.5 (1.5)	0.5 (1.5)
Transportation	1.7 (1.9)	2.0 (2.1)	2.4 (2.7)	2.4 (2.3)	1.6 (1.3)
Total sedentary hours/weekend	14.8 (7.3)	17.4 (10.2)	15.4 (9.4)	15.5 (10.6)	13.5 (7.1)
Total weekend (hours/day)	7.4 (3.6)	8.7 (5.1)	7.7 (4.7)	7.7 (5.3)	6.7 (3.5)

Table A-3. Mean Hours/Weekend Day and Standard Deviations (SD) for All Sedentary Behavior Questionnaire Items and Summary Score for Gender

	Males	Females
	Mean (SD)	Mean (SD)
Playing computer or video games	4.5 (5.7)	1.4 (3.8)
Sit listen to music	5.6 (5.7)	5.7 (7.2)
Talk on the phone	2.0 (2.4)	3.2 (3.7)
Paperwork/Computer	8.6 (7.8)	12.6 (8.1)
Reading	1.6 (2.5)	2.7 (3.9)
Playing musical instrument	0.2 (1.3)	0.4 (2.9)
Arts and Crafts	0.2 (1.1)	0.9 (2.9)
Transportation	4.1 (5.0)	4.3 (4.5)
Total sedentary hours/weekend	34.8 (20.3)	38.6 (20.6)

Table A-4. Mean Hours/Week and Standard Deviation (SD) for All Physical Activity Levels and Summary Score for All Class Standings

	Freshmen	Sophomore	Junior	Senior	Graduate Student
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Vigorous	4.0 (4.9)	6.4 (7.4)	6.7 (7.2)	4.7 (5.3)	4.2 (4.1)
Moderate	5.3 (9.1)	5.6 (8.5)	5.7 (7.3)	3.8 (5.3)	5.5 (7.3)

APPENDIX B:

List of Figures

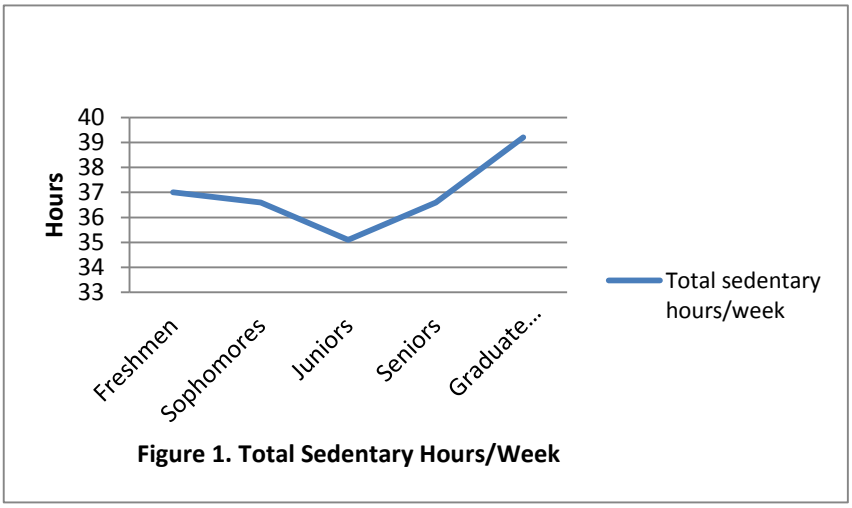

Figure 1. Total Sedentary Hours/Week

B-1

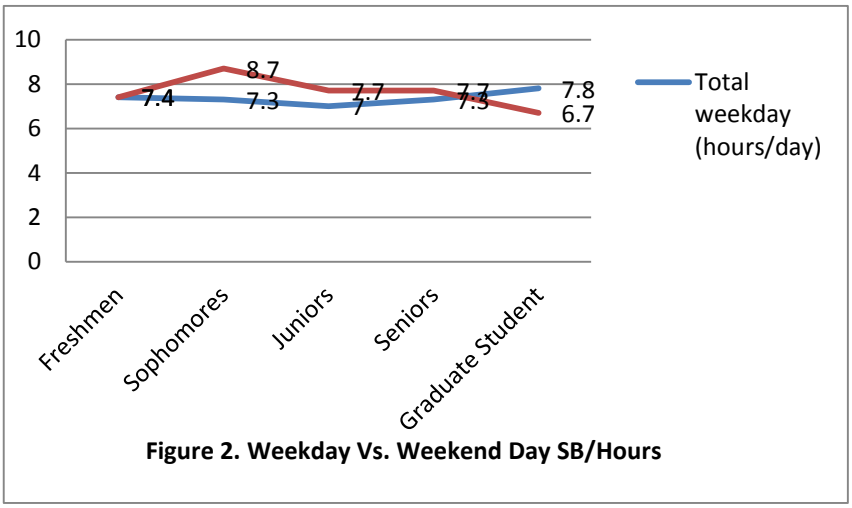

Figure 2. Weekday Vs. Weekend Day SB/Hours

B-2.

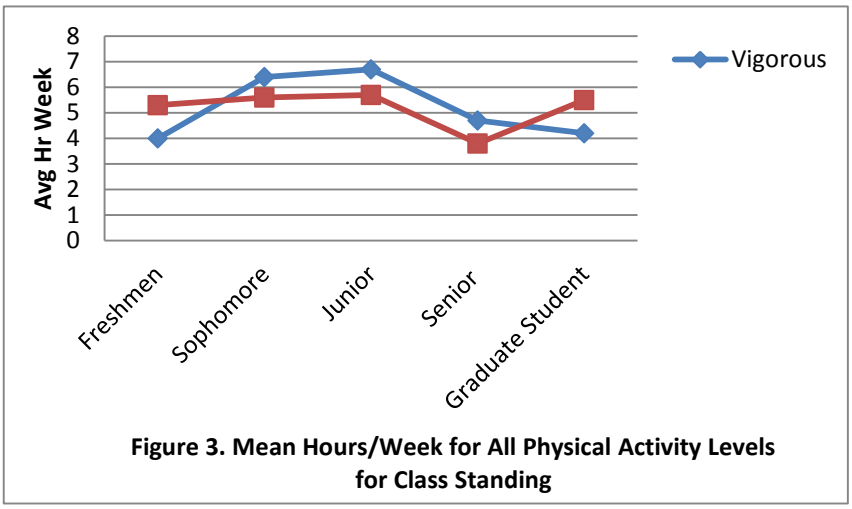

Figure 3. Mean Hours/Week for All Physical Activity Levels for Class Standing

B-3

APPENDIX C:

Recruiting Script

Recruiting Scripts

Script for In-Class Announcements:

"Hello, my name is Codie Monhollen. I am a graduate student and a teaching assistant in the Department of Exercise and Sports Science here at Eastern Kentucky University. Along with Dr. Louisa Summers, Dr. Matt Sabin, and Dr. Jack Rutherford as my advisors, I am conducting a study on physical activity, sedentary behaviors, and exercise stage of change. The purpose of the study is to analyze the relationship between sedentary behavior, physical activity and the exercise stages of change. Four hundred and fifty college students will be included in the study. Participants must be between the ages of 18-40 years old.

The objective of the investigation will be to analyze the sedentary behaviors, physical activity levels, and exercise stage of change of students at Eastern Kentucky University. Sedentary behavior will be assessed using the Sedentary Behavior Questionnaire and the Exercise Stages of Change, along with International Physical Activity Questionnaire. Additionally, the researchers will examine the relationship between physical activity between class rank i.e. freshmen to seniors. The study included the following procedural steps: instrumentation (passing out questionnaires), data collection, and data analysis.

Male and female participants between the ages of 18-40 years old will be recruited through Eastern Kentucky University's Exercise & Sport Science and Health majors during the fall 2014 semester. Student classification is as followed, Freshmen 0-29 hours, Sophomores 30-59 hours, Juniors 60-89 hours, Seniors 90 or more hours, and graduate students. Students who are not full time (less than 12 credit hours and 9 credit hours for graduate students) will be excluded from the study. 90 participants will be recruited from each class rank. After indicating interest in the study, full time students will be asked to complete the 4 questionnaires. These questions relate to demographic information, such as age, race, sex, class rank and non-traditional student status. Additionally, each participant will complete a Sedentary Behavior Questionnaire, Exercise Stages of Change, and a International Physical Activity Questionnaire

There is no cost to participate in the study. I am now going to hand out the 4 questionnaires.

Hand out demographic questionnaire the Exercise Stage of Change Questionnaire, the Sedentary Behavior Questionnaire, International Physical Activity Questionnaire recall, give time to complete them, and collect them.

"Thank you for your interest and willingness to contribute to this important project. Do you have any questions?"

APPENDIX D:

Informed Consent Form

Consent to Participate in a Research Study

Sedentary behaviors and physical activity in relation to class standing in university students

Why am I being asked to participate in this research?

You are being invited to take part in a research study on relationship between sedentary behavior, physical activity and the exercise stages of change. You are being invited to participate in this research study because you are a student at Eastern Kentucky University.

Who is doing the study?

The Principle Investigator is Codie Monhollen, B.A., graduate teaching assistant at Eastern Kentucky University. He is being guided in this research by Dr. Louisa Summers, Dr. Matthew Sabin, and Dr. Jack Rutherford. There may be other people on the research team assisting at different times during the study.

What is the purpose of the study?

The purpose of the investigation will be to analyze the sedentary behaviors, physical activity levels, and exercise stage of change of students at Eastern Kentucky University. Sedentary behavior will be assessed using the Sedentary Behavior Questionnaire and the Exercise Stages of Change, along with International Physical Activity Questionnaire. Additionally, the researchers will examine the relationship between physical activity between class rank i.e. freshmen to seniors. The study included the following procedural steps: instrumentation (passing out questionnaires), data collection, and data analysis.

Where is the study going to take place and how long will it last?

The research procedures will be conducted at Exercise & Sport Science and Health majors courses at Eastern Kentucky University as these are the locations were the surveys will be distributed.

What will I be asked to do?

You will be asked to:

- Read the *Informed Consent Form* (this document) and sign and date it if you agree to participate in the study.
- Fill out the *Exercise Stage of Change Questionnaire.*
- Fill out the *International Physical Activity Questionnaire*
- Fill out the *Sedentary Behavior Questionnaire*
- Upon completing the questionnaires the principal investigator will collect and place them into a envelope.

Are there reasons why I should not take part in this study?

At this point, we have determined you to be eligible to participate in the research study. If you feel uncomfortable with the testing procedures, you may withdraw from the study, at any point.

What are the possible risks and discomforts?

There are no risks, except possible disappointment as to your particular level of physical activity or sedentary behavior. However, experience a previously unknown risk or side effects.

Will I benefit from taking part in this study?

We cannot and do not guarantee that you will receive any benefits from this study.

Do I have to take part in this study?

If you decide to take part in the study, it should be because you really want to volunteer. You will not lose any benefits or rights you would normally have if you choose not to volunteer. You can stop at any time during the study and still keep the benefits and rights you had before volunteering.

If I don't take part in this study, are there other choices?

If you do not want to be in the study, there are no other choices except to not take part in the study.

What will it cost me to participate?

There are no costs associated with taking part in this study.

Will I receive any payment or rewards for taking part in the study?

No, there are no monetary awards associated with the study.

Who will see the information I give?

Your information will be combined with information from the other 450 (approximate) people taking part in the study. All data will be analyzed via the experimental verses control group. Your name will not be identified in any written materials. The only document linking your name to data will be the ID assignment master list, which will be destroyed upon the conclusion of the study.

We will make every effort to prevent anyone who is not on the research team from knowing that you gave us information, or what that information is. For example, your name will be kept separate from the information you give, and these two things will be stored in different places under lock and key.

However, there are some circumstances in which we may have to show your information to other people. For example, the law may require us to show your

information to a court. Also, we may be required to show information that identifies you to people who need to be sure we have done the research correctly; these would be people from such organizations as Eastern Kentucky University and the University Research Committee.

Can my taking part in the study end early?

If you decide to take part in the study, you still have the right to decide at any time that you no longer want to participate. You will not be treated differently if you decide to stop taking part in the study.

The individuals conducting the study may need to end your participation in the study. They may do this if you are not able to follow the directions they give you, if they find that your being in the study is more risk than benefit to you, or if the agency funding the study decides to stop the study early for a variety of scientific reasons.

What happens if I get hurt or sick during the study?

If you believe you are hurt or if you get sick because of something that is done during the study, you should call Codie Monhollen at (740) 683-9442 immediately. It is important for you to understand that Eastern Kentucky University will not pay for the cost of any care or treatment that might be necessary because you get hurt or sick while taking part in this study. That cost will be your responsibility. Also, Eastern Kentucky University will not pay for any wages you may lose if you are harmed by this study.

Usually, medical costs that result from research-related harm cannot be included as regular medical costs. Therefore, the costs related to your child's care and treatment because of something that is done during the study will be your responsibility. You should ask your insurer if you have any questions about your insurer's willingness to pay under these circumstances.

What if I have questions?

Before you decide whether to accept this invitation to take part in the study, please ask any questions that might come to mind now. Later, if you have questions about the study, you can contact the investigator, Codie Monhollen at (740) 683-9442. If you have any questions about your rights as a research volunteer, contact the staff in the Division of Sponsored Programs at Eastern Kentucky University at 859-622-3636. We will give you a copy of this consent form to take with you.

What else do I need to know?

You will be told if any new information is learned which may affect your condition or influence your willingness to continue taking part in this study.

I have thoroughly read this document, understand its contents, have been given an opportunity to have my questions answered, and agree to participate in this research project.

_____ _____

Signature of person agreeing to take part in the study Date

_____

Printed name of person taking part in the study

_____

Name of person providing information to subject

APPENDIX D:

Demographic Questionnaire

Demographic Questionnaire

Participant ID:_____

Age:_____ Gender:_____ (M/F)

Class Rank:_____ Full time status:_____(Y/N) (12 credits or more for undergrad, 9 or more for graduate students)

Major:_____

Nationality:_____ (Optional)

Ethnicity/Race (Check most predominant origin):

- Asian or Pacific Islander: Person having origins in any of the peoples of the Far East, Southeast Asia, the Indian subcontinent, or the Pacific Islands. This area includes, for example, China, Japan, Korea, the Philippine Islands, Thailand, Vietnam, Indonesia and Samoa.

- African: Persons having origins in any of the peoples from African countries except North African countries.

- Hispanic: Persons having origins in any of the Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Coulters.

- Native American or Alaskan Native: Persons having origins in any of the original peoples of North America.

- Caucasian (not of Hispanic origin): Persons having origins in any of the original peoples of Europe.

- Arabic or Middle Eastern: Persons having origins in any of the peoples from Middle Eastern countries, North African countries, Iraq, Iran, Afghanistan, Saudi Arabia, Yemen, and Oman.

- Other:_____

APPENDIX F:
Sedentary Behavior Questionnaire

SEDENTARY BEHAVIOR: Weekday									
On a typical WEEKDAY, how much time do you spend (from when you wake up until you go to bed) doing the following?									
	None	15 min. or less	30 min.	1 hr	2 hrs	3 hrs	4 hrs	5 hrs	6 hrs or more
1. Watching television (including videos on VCR/DVD).	O	O	O	O	O	O	O	O	O
2. Playing computer or video games.	O	O	O	O	O	O	O	O	O
3. Sitting listening to music on the radio, tapes, or CDs.	O	O	O	O	O	O	O	O	O
4. Sitting and talking on the phone.	O	O	O	O	O	O	O	O	O
5. Doing paperwork or computer work (office work, emails, paying bills, etc.)	O	O	O	O	O	O	O	O	O
6. Sitting reading a book or magazine.	O	O	O	O	O	O	O	O	O
7. Playing a musical instrument.	O	O	O	O	O	O	O	O	O
8. Doing artwork or crafts.	O	O	O	O	O	O	O	O	O
9. Sitting and driving in a car, bus, or train.	O	O	O	O	O	O	O	O	O

SEDENTARY BEHAVIOR: Weekend Day									
On a typical WEEKEND DAY, how much time do you spend (from when you wake up until you go to bed) doing the following?									
	None	15 min. or less	30 min	1 hr	2 hrs	3 hrs	4 hrs	5 hrs	6 hrs or more
1. Watching television (including videos on VCR/DVD).	O	O	O	O	O	O	O	O	O
2. Playing computer or video games.	O	O	O	O	O	O	O	O	O
3. Sitting listening to music on the radio, tapes, or CDs.	O	O	O	O	O	O	O	O	O
4. Sitting and talking on the phone.	O	O	O	O	O	O	O	O	O
5. Doing paperwork or computer work (office work, emails, paying bills, etc.)	O	O	O	O	O	O	O	O	O
6. Sitting reading a book or magazine.	O	O	O	O	O	O	O	O	O
7. Playing a musical instrument.	O	O	O	O	O	O	O	O	O
8. Doing artwork or crafts.	O	O	O	O	O	O	O	O	O
9. Sitting and driving in a car, bus, or train.	O	O	O	O	O	O	O	O	O

APPENDIX G:

International Physical Activity Questionnaire

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days**. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

1. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?

   _____ **days per week**

   ☐ No vigorous physical activities → ***Skip to question 3***

2. How much time did you usually spend doing **vigorous** physical activities on one of those days?

   _____ **hours per day**

   _____ **minutes per day**

   ☐ Don't know/Not sure

Think about all the **moderate** activities that you did in the **last 7 days**. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

3. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

   _____ **days per week**

   ☐ No moderate physical activities → ***Skip to question 5***

4. How much time did you usually spend doing **moderate** physical activities on one of those days?

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

Think about the time you spent **walking** in the **last 7 days**. This includes at work and at home, walking to travel from place to place, and any other walking that you might do solely for recreation, sport, exercise, or leisure.

5. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time?

_____ **days per week**

☐ No walking → ***Skip to question 7***

6. How much time did you usually spend **walking** on one of those days?

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

The last question is about the time you spent **sitting** on weekdays during the **last 7 days**. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

7. During the **last 7 days**, how much time did you spend **sitting** on a **week day**?

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

This is the end of the questionnaire, thank you for participating.