

**Mindfulness, Exercise and Stress Reduction: The Effects of a
University Physical Education Mindfulness-Based Exercise Course in
Increasing Physical Activity**

by

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Abstract

Evidence shows that regular physical activity improves physiological and psychological health (Department of & Human Services, 2000). Research in college students supports a relationship between heightened levels of stress and behavior patterns that may compromise health (Bowen & Marlatt, 2009). Stress is a major issue for college students as they cope with a variety of academic, social, and personal challenges (Towbes & Cohen, 1996). An important developmental task for college students is learning to manage excess or unnecessary distress while actively engaging with healthy, age-appropriate challenges that promote growth (Fergus & Zimmerman, 2005). Previous research on college students supports the effectiveness of the mindfulness based stress reduction program (MBSR) on reduction stress (Deckro, 2002).

Despite the many clear physical and mental health benefits of an active lifestyle many college students are not actively engaged in physical activity levels of moderate exercise for at least 30 minutes, 5 days a week or vigorous exercise for 20 minutes, 3 days a week for developing and maintaining cardiorespiratory and musculoskeletal fitness (Garber et al., 2011). Given these benefits, one would expect participation in physical activity to be the norm. However, evidence indicates that the level of physical activity declines from high school to college, and activity patterns in college populations are generally insufficient to improve health and fitness (Douglas et al., 1997). To be specific 43% of the 2005 National College Health Assessment respondents reported that

they did not engage in moderate exercise for at least 30 minutes or vigorous exercise for 20 minutes in the preceding 7 days (American College Health Association, 2006).

The purpose of this study was to examine the effects of a university Physical Health Education (PHED) mindfulness based exercise course on perceived stress, mindfulness, and physical activity levels on college students. It was hypothesized that (a) students who received the mindfulness based stress reduction instruction as a part of the cardiorespiratory walking for fitness instruction would show an increase in physical activity levels above the control group receiving only the cardiorespiratory walking for fitness instruction; (b) students who received the mindfulness based stress reduction instruction as a part of the cardiorespiratory walking for fitness instruction would show a decrease of perceived stress above the control group receiving only the cardiorespiratory walking for fitness instruction; (c) students who received the mindfulness based stress reduction instruction as a part of the cardiorespiratory walking for fitness instruction would show an increase in mindfulness above the control group receiving only the cardiorespiratory walking for fitness instruction; and (d) there would be a difference between the MBSR intervention and control group over time (pre, 4 week, 8week, and post) for physical activity, mindfulness, and perceived stress.

A total of 50 college students participated in the study, 41 students completed the course, while 34 participants data were used in the statistical analysis. After having attained letters of informed consent the researcher measured the weight, height and stride

length of all participants. An Omron HJ-720 ITC pedometer was distributed to each participant and asked to wear it for one week (five week days and two weekend days) during waking hours to assess physical activity at four data collection points. At the end of the each data collection week the researcher collected the pedometers from the participants.

Three 2 (Group) x 4 (Time) ANOVAs were conducted to determine the effects of group on physical activity (pedometer step counts), mindfulness, and perceived stress. Results did not reveal a statistically significant main effect for groups on physical activity, mindfulness, and perceived stress. The ANOVA analysis did however reveal a significant within subjects effect, ($F_{(df = 3,96)} = 3.62, p > .05, \eta^2 = .10$).

In conclusion the assessment of the effectiveness of a 15 week curriculum based physical activity intervention on increasing physical activity levels, mindfulness, and reducing perceived stress of college students revealed no differences between the control and intervention group. The mindfulness based stress reduction (MBSR) program has demonstrated increases in mindfulness and stress-reduction effects among college students, this study implemented an adaptation of the MBSR program for inclusion into a PHED semester course. Future research should explore additional PHED programmatic designs that will include components of group dialogue and discussions aimed at enhancing awareness in everyday life and tailored instruction emphasizing exercise health behavior values.

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Chapter I

Introduction

Physical inactivity and unhealthy eating contribute to obesity, cancer, cardiovascular disease, diabetes, stroke, and kidney disease, which together are responsible for approximately 1.5 million deaths each year. Sedentary lifestyles are responsible for increased rates of mortality (Kaplan, Strawbridge, Cohen, & Hungerford, 1996; Kujala, Kaprio, Sarna, & Koskenvuo, 1998; Paffenbarger et al., 1993). Poor fitness and low physical activity levels have been found to be better predictors of premature death than smoking, diabetes, or obesity (US Department of Human and Health Services, 2002).

Most of us know that being physically active makes us feel better and look better, and there is also compelling evidence that regular physical activity can increase longevity. Regular physical activity has many physical and mental health benefits that are immediate and long term. Engaging in a physical activity increases endurance, strength, and flexibility, promotes healthier muscles, bones, and joints, and increases energy (calorie) expenditure for improved metabolism and body composition. Physical activity increases energy allowing individual's to feel more alive and alert. There are mental health advantages to being physically active: improved ability to cope with stress, improved mood, higher self-esteem, and greater sense of well-being, improved ability to fall asleep and sleep well and reduction of anxiety, tension, and depression. Physical activity reduces feelings of depression and anxiety and promotes psychological well-being. Participating in regular physical activity reduces risk of dying prematurely from all causes, reduces risk of developing and/or dying from heart disease, diabetes, high blood

pressure, and colon cancer, and reduces the risk of becoming obese. A reduction in the risk of falls and fractures have been observed in older adults. The benefits of exercise on health range from improved well-being, quality of life, and a reduction in the cost of health care.

A physically inactive lifestyle profoundly affects the quality of life of individuals from the stance of both medical and financial sufferings. Economic consequences of inactivity are substantial for the health care system. Direct medical costs may include preventive, diagnostic, and treatment services related to physical inactivity. The Medicare and Medicaid programs report spending \$84 billion annually on five major chronic conditions that could be significantly improved by increased physical activity: diabetes, heart disease, depression, cancer, and arthritis (US Department of Human and Health Services, 2002). Adults who are physically active on average experience a more enriched quality of life and longer lifespan than individuals who do not participate in leisure-time physical activity.

Inadequate physical activity is not restricted to adults a startling percent of youth do not engage in moderate to vigorous physical activity. Despite national guidelines for physical activity, many young persons are not regularly physically active. Elementary and middle school aged students are more likely to participate in physical education classes than high school students. With the onset of physical inactivity occurring much earlier during pre-adolescence and the growing trend of sedentary behavior during adulthood, it is apparent that physical education's role is crucial in meeting important public health goals for the future. Physical inactivity among college students is a significant public health concern. There are noted declines as students enter college and

again immediately after graduation (Leslie, Sparling, & Owen, 2001). There are reports that up to 50% of college students are not physically active at the recommended levels.

Despite the well-known health benefits of physical activity most adults are leading sedentary lifestyles. Most of the cited reasons carry undertones of negative judgment, all of which are counter-intuitive to the non-judgmental tenet of mindfulness- a process whereby an individual observes their immediate experience using an open and non-judgmental stance. The Mindfulness Based Stress Reduction (MBSR) program was developed by Jon Kabat-Zinn over 30 years ago in the Stress Reduction Clinic at the University of Massachusetts Medical Center in Worcester, Massachusetts. Kabat-Zinn developed the preliminary program in 1979 to train chronic pain patients in self-regulation of pain through attentional meditation. Participants reported over a 50% reduction in perceived pain and 60% reported a reduction in negative mood experiences. Using this landmark study (J. Kabat-Zinn, Lipworth, Burney, & Sellers, 1987) as foundation to converge this program with other behavioral science disciplines the MBSR has been used in empirical studies examining psychological distress reduction, well-being, coping mechanism and in substance abuse programs.

Research suggests that perceived stress plays an important role between health and inactivity. The goal of MBSR practice is to reduce stress and suffering by developing equanimity in the mind and body, as well as insight into the mental and physical conditions that inhibit an individual's capacity to respond pro-actively and effectively to everyday events. Thereby allowing an individual to pro-actively respond to prioritized values of health and exercise for increased motivation and adherence to exercise.

Prioritized values of health and exercise can be promoted through skills taught in the MBSR program. The best outcome increased physical activity and mindfulness that improves physical and mental health and quality of life. Therefore the purpose of this study was to assess the effectiveness of a 15 week curriculum based physical activity intervention on increasing physical activity levels, mindfulness, and reducing perceived stress of college students.

Statement of Purpose

Unfortunately, there are no published studies examining the effects of mindfulness based physical activity instructional college programs nor are there any published studies investigating mindfulness-based meditation as a component of interventions designed to increase physical activity in any population. An alarming 57% of college students surveyed, using the National College Health Assessment (American College Health Association, 2006), reported that they did not engage in moderate exercise for at least 30 minutes, 5 days a week or vigorous exercise for 20 minutes, 3 days a week for developing and maintaining cardiorespiratory and musculoskeletal fitness (Garber, et al., 2011) in the preceding 7 days. This situation and the lack of information about the employment of a mindfulness based stress reduction physical activity instructional programs targeting physical activity levels in college students suggests a need to better understand the effects of such interventions. The purpose of this study was to examine the effects of a university Physical Health Education (PHED) mindfulness based exercise course on perceived stress, mindfulness, and daily steps (i.e., average steps count) during the week days and weekend days on college students.

Hypotheses

In the current study, it was hypothesized that:

1. Students who receive the mindfulness based stress reduction instruction as a part of the cardiorespiratory walking for fitness instruction will show an increase in physical activity levels above the control group receiving only the cardiorespiratory walking for fitness instruction.
2. Students who receive the mindfulness based stress reduction instruction as a part of the cardiorespiratory walking for fitness instruction will show an increase in mindfulness above the control group receiving only the cardiorespiratory walking for fitness instruction.
3. Students who receive the mindfulness based stress reduction instruction as a part of the cardiorespiratory walking for fitness instruction will show a decrease of perceived stress above the control group receiving only the cardiorespiratory walking for fitness instruction.
4. There will be a difference between the MBSR intervention and control group over time (pre, 4 week, 8week, and post) for physical activity, mindfulness, and perceived stress.

Definition of Terms

Physical Activity and Exercise

Two terms are widely used to describe human movement: *physical activity* and *exercise*.

Although they are often used interchangeably, their definitions differ.

Physical activity is any bodily movement produced by the contraction of skeletal muscle that increases energy expenditure above a basal level.

Exercise is a subcategory of physical activity that is "planned, structured, repetitive, and purposive in the sense that the improvement or maintenance of one or more components of physical fitness is the objective"

Activities of daily living. Activities required for everyday living, including eating, bathing, toileting, dressing, getting into or out of a bed or chair, and basic mobility.

Aerobic exercise (training). Exercise that primarily uses the aerobic energy-producing systems, can improve the capacity and efficiency of these systems, and is effective for improving cardiorespiratory endurance.

Flexibility exercise. Exercises that enhance the ability of a joint to move through its full range of motion.

Leisure-time physical activity. Physical activities performed by a person that are not required as essential activities of daily living and are performed at the discretion of the

person. These activities include sports participation, exercise conditioning or training, and recreational activities such as going for a walk, dancing, and gardening.

Lifestyle activities. This term is frequently used to encompass activities that one carries out in the course of one's daily life, that can contribute to sizeable energy expenditure, e.g., taking the stairs instead of using the elevator, walking to do errands instead of driving, getting off one bus stop earlier, or parking further away than usual to walk to a destination.

Terms related to patterns of physical activity or exercise are defined here:

Accumulation. The concept of meeting a specific physical activity dose or goal by performing activity in short bouts, then adding together the time spent during each of these bouts. For example, a 30-minute per day goal could be met by performing 3 bouts of 10 minutes each throughout the day.

Dose. In the field of physical activity, dose refers to the amount of physical activity performed by the subject or participants. The total dose or amount is determined by the three components of activity: frequency, duration, and intensity. Frequency is commonly recorded as sessions, episodes, or bouts per day or per week. Duration is the length of time for each bout of any specific activity. Intensity is the rate of energy expenditure necessary to perform the activity to accomplish the desired function (aerobic activity) or the magnitude of the force exerted during resistance exercise.

Dose response. The relation between the dose of physical activity and the health or fitness outcome of interest is considered the dose response. The dose can be measured in terms of a single component of activity (e.g., frequency, duration, intensity) or as the total amount. This concept is similar to the prescription of a medication where the expected response will vary as the dose of the medication is changed. The dose-response relation can be linear, exponential, or hyperbolic, and the dose-response relation is likely to vary depending on the primary measure of interest. For example, improvements in cardiorespiratory fitness, bone health, or adiposity are common dose-response measures of interest. A dose of physical activity may exist below which no effect has been detected as well as a dose above which no effect has been detected. These seemingly lowest and highest doses of activity may be called "thresholds," but the term should be used cautiously as these apparent limits may be more related to limitations of measurement than to true biological limits.

Duration. The length of time in which an activity or exercise is performed. Duration is generally expressed in minutes.

Frequency. The number of times an exercise or activity is performed. Frequency is generally expressed in sessions, episodes, or bouts per week.

Intensity. Intensity refers to how much work is being performed or the magnitude of the effort required to perform an activity or exercise. Intensity can be expressed either in *absolute* or *relative* terms.

Physical Fitness

During the 20th century, **physical fitness** has been defined in a variety of ways, but a generally accepted definition is "the ability to carry out daily tasks with vigor and alertness, without undue fatigue and with ample energy to enjoy leisure-time pursuits and meet unforeseen emergencies". It has been defined by the World Health Organization as "the ability to perform muscular work satisfactorily". Physical fitness includes a number of components consisting of cardiorespiratory endurance (aerobic power), skeletal muscle endurance, skeletal muscle strength, skeletal muscle power, flexibility, balance, speed of movement, reaction time, and body composition. Because these attributes differ in their importance to athletic performance versus health, a distinction has been made between *performance-related fitness* and *health-related fitness*. Performance-related fitness includes those attributes that significantly contribute to athletic performance and places emphasis on aerobic endurance or power, muscle strength and power, speed of movement, and reaction time. Health-related fitness includes cardiorespiratory fitness, muscular strength and endurance, body composition, flexibility, and balance. The relative importance of any one attribute depends on the specific performance or health goal.

The following terms relate to specific aspects of physical fitness.

Body composition. A health-related component of physical fitness that applies to body weight and the relative amounts of muscle, fat, bone, and other vital tissues of the body. Most often, the components are limited to fat and lean body mass (or fat-free mass).

Cardiorespiratory fitness (endurance). A health-related component of physical fitness that is the ability of the circulatory and respiratory systems to supply oxygen during sustained physical activity. Usually expressed as measured or estimated maximal oxygen uptake (VO_{2max}).

Flexibility. A health and performance-related component of physical fitness that is the range of motion possible at a joint. Flexibility is specific to each joint and depends on a number of specific variables, including but not limited to the tightness of specific ligaments and tendons.

Health Numerous definitions of health exist and, "Health is a human condition with physical, social and psychological dimensions, each characterized on a continuum with positive and negative poles. Positive health is associated with a capacity to enjoy life and to withstand challenges; it is not merely the absence of disease. Negative health is associated with morbidity, and in the extreme, with premature mortality".

Quality of Life (QoL) is an individual's overall sense of well-being and includes such factors as pain, mood, energy level, family and social interactions, sexual function, ability to work, and ability to keep up with routine daily activities.

Mindfulness Based Stress Reduction (MBSR) program is a way of learning to relate directly to whatever is happening in your life, a way of taking charge of your life, a way of doing something for yourself that no one else can do for you — consciously and systematically working with your own stress, pain, illness, and the challenges and demands of everyday life.

Mindfulness refers to a meditation practice that cultivates present moment awareness. Mindfulness involves attending to relevant aspects of experience and maintaining awareness moment by moment, disengaging oneself from strong attachment to beliefs, thoughts or emotions in a nonjudgmental manner thereby developing a greater sense of emotional balance and well-being.

Present moment awareness. When a person is able to perform each daily action, be it: eating, working, or walking, in a constant state of heightened awareness, without losing ourselves in thoughts concerning the past or the future, fully absorbed in the present activity

Body scan involves a gradual, thorough sweeping of attention through the entire body, focusing non-critically on sensations or feelings in body regions with suggestions of breath awareness, acceptance, and relaxation. The Body Scan is a journey through the geography of the physical form.

Hatha yoga. This type of yoga involves simple stretches and postures (asanas) designed to strengthen the body and increase flexibility via relaxation of the musculoskeletal system and the development of mindful movement. Yoga is considered to be “meditation in motion,” wherein focused body awareness of each movement is gently coordinated with breathing.

Sitting meditation. Sitting meditation Involves attention to the breath and other psychophysical perceptions, with an observational yet non-judging awareness of cognitions and distractions that constantly flow through the mind.

Mindful walking. This is the practice of being in the now and paying attention to all physical sensations and fluctuations in concentrative awareness during the mundane activity of walking.

Self-compassion. Is defined as the ability to hold one's feelings of suffering with a sense of warmth, connection, and concern. Similar to having compassion for others; however, feelings of kindness are extended to oneself.

Delimitations

The delimitations of this study are:

Only undergraduate students from a large Southeastern University were assessed. Therefore the findings may not be generalized to all college students within the region that differ in institutional type (i.e., regional, urban, or Historically Black College and University-HBCU), across the nation, and internationally.

Chapter II

Review of Literature

The purpose of this study was to examine the effects of a university Physical Education (PHED) mindfulness based exercise course on perceived stress, mindfulness, and daily steps (i.e., average steps count) during the week days and weekend days on college students. This chapter outlines the literature on the following topics; a) physical activity and public health, b) physical activity status and recommendation levels, c) physical activity adherence and, d) mindfulness based stress reduction.

PHYSICAL INACTIVITY AND PUBLIC HEALTH

There is ample evidence to support the observation that physical inactivity is detrimental to health and physical activity is beneficial. An inverse correlation has been identified between the volume of physical activity and all-cause mortality, with minimal adherence to exercise guidelines resulting in a 20-30% reduction in the risk of all-cause mortality (Lee & Skerrett, 2001). Low levels of physical activity are inversely correlated to rates of coronary heart disease and death when compared to men with moderate to high levels of physical activity (Leon, Connett, Jacobs, & Rauramaa, 1987). Regular physical activity decreases the risk of many diseases, including type 2 diabetes (Knowler et al., 2002), osteoporosis, obesity, breast cancer, colon cancer, and falls in older adults (Marcus et al., 2006).

The U.S. Department of Health and Human Service's Physical Activity Guidelines Advisory Committee Report (2008) summarized the scientific evidence for

the health benefits of habitual physical activity and the risks of sedentary behavior. This report provided the rationale for government physical activity guidelines. The committee investigated the link between physical activity and all-cause mortality (deaths from all causes) by looking at 73 studies dating from 1995 to 2008. The subjects of the studies were both men and women, from age groups (16 to 65), and from different racial and ethnic groups. The data from these studies strongly support an inverse relation between physical activity and all-cause mortality. These inverse associations were found not just for healthy young adults but also for older adults (age 65 and older), people with coronary artery disease and diabetes, people with impaired mobility, and people who were overweight or obese. Poor fitness and low physical activity levels were found to be better predictors of premature death than smoking, diabetes, or obesity.

The Advisory committee found that about 150 minutes (2 to 2.5 hours) of physical activity per week is sufficient to decrease all-cause mortality. It appears that it is the overall volume of energy expended, regardless of what kinds of activities produce the energy expenditure that makes a difference in risk of premature death. The committee also looked at whether there is a dose response relation between physical activity and all-cause mortality, that is, whether more activity results in a greater reduction in death rates. Again, the studies showed an inverse relation between these two variables. More activity above and beyond 150 minutes per week produced greater benefits. For inactive people, benefits are seen at levels below 150 minutes per week. In fact, any increase in physical activity resulted in reduced risk of death. The committee refers to this as the “some is good; more is better” message. A target of 150 minutes per week is recommended, but any level of activity below the target is encouraged for inactive individuals.

Looking more closely at this relationship, the committee found that the greatest risk reduction is seen at the lower end of the physical activity spectrum (30 to 90 minutes per week). In fact, sedentary people who become more active have the greatest potential for improving health and reducing the risk of premature death. Additional risk reduction occurs as physical activity increases, but at a slower rate. For example, individuals who engaged in physical activity 90 minutes per week had a 20% reduction in mortality risk compared with inactive people, and individuals who were active 150 minutes per week, as noted earlier, had a 30% reduction in risk. But to achieve a 40% reduction in mortality, individuals had to be physically active 420 minutes per week (7 hours) (Fahey, Insel, & Roth, 2011). Exercising even a modest amount provides benefits to health.

Despite the many benefits of an active lifestyle, levels of physical activity remain low for all populations of Americans. In December 2008, the Centers for Disease Control and Prevention (CDC) reported that about 31% of adult Americans participate in some leisure-time physical activity. Leisure-time physical activity decreased by nearly 6% between 2003 and 2009. The CDC also reported that physical activity levels declined with age and were higher in men than in women while physical activity levels were lower in Hispanics, American Indians, and Blacks than in Caucasians. Approximately 25% of Americans participate in no leisure-time physical activity, a level that has remained steady for a decade. People with higher levels of education are more active than people with lower educational attainment. For example, 54% of college graduates exercise regularly, compared with 37% of high school dropouts. About 12% of Americans report exercising vigorously for more than 20 minutes, three times per week. However,

electronic measurements, using digital pedometers, of people involved in normal daily activity showed that the actual number is closer to 3% (Fahey, et al., 2011).

Cardiovascular disease (CVD) is the leading cause of death in the United States. Approximately 58 million persons in the United States (20% of the total population) have one or more types of CVD (Centers for Disease Control and Prevention, 1998). These types of CVD include: high blood pressure, coronary heart disease (CHD), stroke, rheumatic heart disease, and other forms of heart disease. Behavioral risk factors for CVD include physical inactivity and being overweight. In 2007 CVD accounted for 33.6% of all deaths in the United States (Centers for Disease Control and Prevention, 2007).

Other major morbidity's caused by inactivity includes colon cancer, osteoporosis and particularly hip fracture and Type II diabetes (US Department of Human and Health Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, & The President's Council on Physical Fitness and Sports, 1996). Higher levels of activity may reduce the risk of breast cancer, colon cancer, and chronic diseases the degree of this relation remains unclear. In each of these major medical conditions, the adverse effect of physical inactivity is independent of body weight or adiposity (Colditz, 1999) . As a consequence of this independence, the burden of inactivity can be added to that attributable to obesity (Colditz, 1999). During the past 20 years, there has been a dramatic increase in obesity in the United States and rates remain high. In 2010, no state had a prevalence of obesity less than 20%. Thirty-six states had a prevalence of 25% or more; 12 of these states (Alabama, Arkansas, Kentucky, Louisiana, Michigan, Mississippi, Missouri, Oklahoma, South Carolina, Tennessee,

Texas, and West Virginia) had a prevalence of 30% or more (Centers for Disease Control and Prevention, Division of Nutrition Physical Activity and Obesity, & National Center for Chronic Disease Prevention and Health Promotion, 2011).

The Financial Cost

Medical advances are helping people live longer. But obesity is reaching epidemic proportions. The population is aging and expanding with the baby boomers (persons born between the years 1946-1964). Chronic conditions also cost vast amounts of money. The trends are completely going in a negative direction. Obesity increases the risk of developing chronic disease conditions, such as diabetes and heart disease. Without major changes in health behaviors, 1 in 3 babies born today will develop diabetes during the course of their lifetime. Average healthcare costs for someone who has one or more chronic conditions is 5 times greater than for someone without any chronic conditions (Partnership for Solutions, 2004). Chronic diseases account for \$3 of every \$4 spent on healthcare. That's approximately \$7,900 for every American with a chronic disease. These chronic diseases drive healthcare costs at an alarming annual rate. Heart disease and stroke account for nearly \$432 billion/year. Diabetes accounts for nearly \$174 billion/year. Lung disease accounts for nearly \$154 billion/year. Alzheimer's disease accounts for nearly \$148 billion/year (Centers for Disease Control and Prevention, 2007). Today, Americans suffering from chronic diseases face rising healthcare costs. They also receive lower quality care and have fewer options. Health insurance co-pays and out-of-pocket expenses continue to rise.

The Human Cost

The human cost of chronic diseases, which may be caused in whole or in part by physical inactivity, cannot be ignored. The CDC reports that chronic diseases cause 7 out of every 10 deaths (2007). Chronic diseases such as diabetes, cancer, and heart disease are the leading causes of disability and death in the US (Centers for Disease Control and Prevention, 2007). About 25% of people with chronic diseases have some type of activity limitation. This includes difficulty or needing help with personal tasks such as dressing or bathing. It may also mean being restricted from work or attending school. In many cases, choices and care are limited. The disabling and long-term symptoms that often come with chronic diseases add to extended pain and suffering of both the individual and family caregivers. This decreases the overall quality of life. Morbidity and mortality costs are indirect costs. Morbidity costs are defined as the value of income lost from decreased productivity, restricted activity, absenteeism, and bed days. Mortality costs are defined as the value of future income lost by premature death (Centers for Disease Control and Prevention Division of Nutrition Physical Activity and Obesity National Center for Chronic Disease Prevention and Health Promotion, 2011). The human cost of morbidity and mortality resulting from chronic diseases continue to soar. The threat of the inaccessibility of available or affordable healthcare of chronic disease, resulting in lower quality of care and life is key for review of institutional systems analysis to reduce the human cost impact of chronic diseases

PHYSICAL ACTIVITY STATUS AND RECOMMENDATIONS

In a nationally representative survey conducted by the Centers for Disease Control and Prevention (2010), 77% of children aged 9–13 years reported participating in free-time physical activity during the previous 7 days. In 2009, only 18% percent of high school students surveyed had participated in at least 60 minutes per day of physical activity on each of the 7 days before the survey with 11.4% of girls reporting and 24.8% boys reporting participation. Twenty-three percent of high school students surveyed had not participated in 60 or more minutes of any kind of physical activity on any day during the 7 days before the survey. Participation in physical activity declines as young people age. In 2009, over half (56%) of high school students (72% of 9th-grade students but only 44% of 12th-grade students) attended physical education classes in an average week. The percentage of high school students who attended physical education classes daily decreased from 42% in 1991 to 25% in 1995 and remained stable at that level until 2009 (33%). In 2009, 47% of 9th-grade students and only 22% of 12th-grade students attended physical education class daily (Centers for Disease Control and Prevention, 2010). Only five states—New Hampshire, New Mexico, New York, Vermont and Virginia—require physical activity assessment in every grade, K-12 (National Association for Sport and Physical Education & American Heart Association, 2010).

The National Association for Sport and Physical Education offers national recommendations for children (5 to 12 years of age) on physical activity. These guidelines are: (a) Children should engage in at least 60 minutes and up to several hours of daily, of age-appropriate physical activity on all, or most days of the week. This accumulative time should include moderate and vigorous physical activity with the

majority of the activities being spent in activity that is intermittent in nature; (b) Children should engage in several bouts of physical activity lasting 15 minutes or more each day; (c) Each child should participate every day in a variety of age-appropriate physical activities designed to achieve optimal health, wellness, fitness, and performance benefits; (d) Extended periods of inactivity (two or more hours) are not recommended for children, especially during the daytime hours (National Association for Sport and Physical Education & American Heart Association, 2004).

Physical inactivity among college students is a significant public health concern. There are noted declines as students enter college and again immediately after graduation (Leslie, Sparling, & Owen, 2001). There are reports that up to 50% of college students are not physically active at the recommended levels. Sparling and Snow (2002) reported that non-exercisers during their senior year were more likely to report similar or less activity 2 to 10 years post-graduation. Increasing physical activity during the college years is important as this transitional period seems to be a time of activity decline.

On average 35% of college students are overweight or obese and only 36.6% of college students participate in regular, leisure time activity. The National Association for Sport and Physical Education (NASPE) and the College and University Physical Education Council (CUPEC) supports the position for all colleges and universities to uphold a physical activity instructional program for students as a strong and integral part of the academic curriculum (American Alliance for Health Physical Education Recreation Dance National Association for Sport Physical Education, 2007). NASPE posits that offering programs that teach empirically supported behavior change methods, college physical activity programs can provide opportunities for college students to acquire

lifetime physical activity skills needed to succeed in self-directed activity. The status of Colleges and University Instructional Physical Activity Programs (CUIPAP) in the United States was researched in 1998 and profiled public and private institutions with student enrollment greater than 500 (Hensley, 2000). Three-fourths of the institutions reported offering an undergraduate Physical Education or Kinesiology major and 32% reported offering advanced degrees, masters and/or doctorate. Hensley's study indicated that 63% of institutions require instructional physical activity programs (IPAP) as a graduation requirement. While one-third of the institutions with an enrollment greater than 10,000 require IPAP as a graduation requirement compared to 70% of the institutions with fewer than 10,000 students. Students enrolled in the IPAP courses were mostly freshman (42%) and sophomores (25%). The most popular IPAP course indicated by institutions were in order of popularity, (1) fitness or aerobic activities, (2) weight training, (3) golf, (4) tennis, (5) bowling and (6) racquetball. While some students are required to take IPAP courses, other students may be motivated to enroll in a course for health and fitness related reasons, to learn or practice a sport skill, or to take advantage of social opportunities offered in an activity course (Armstrong, O'Bryant, & Costa, 2002; Engstrom, 1999; Leenders, Sherman, & Ward, 2003). Further, the literature on IPAP has revealed that men and women take classes for different reasons. Armstrong et al. (2002) found that males' primary motives include obtaining regular exercise, competition, achieving a good grade, and obtaining lifelong activity skills. For female students, primary motives ranged from maintaining a desirable weight or body composition, having fun, and developing social opportunities.

To promote and maintain health, American College of Sports Medicine and the American Heart Association recommends that all healthy adults aged 18 to 65 years need moderate-intensity aerobic (endurance) physical activity for a minimum of 30 min on five days each week or vigorous-intensity aerobic physical activity for a minimum of 20 min on three days each week. Combinations of moderate- and vigorous-intensity activity can be performed to meet this recommendation. For example, a person can meet the recommendation by walking briskly for 30 min twice during the week and then jogging for 20 min on two other days. Moderate-intensity aerobic activity, which is generally equivalent to a brisk walk and noticeably accelerates the heart rate, can be accumulated toward the 30-min minimum by performing bouts each lasting 10 or more minutes. Vigorous-intensity activity is exemplified by jogging, and causes rapid breathing and a substantial increase in heart rate. In addition, every adult should perform activities that maintain or increase muscular strength and endurance a minimum of two days each week. Because of the dose-response relation between physical activity and health, persons who wish to further improve their personal fitness, reduce their risk for chronic diseases and disabilities or prevent unhealthy weight gain may benefit by exceeding the minimum recommended amounts of physical activity(Haskell et al., 2007).

PHYSICAL ACTIVITY MOTIVATION AND ADHERENCE

Intrinsic motivation pertains to engagement in an activity because of the inherent pleasures and satisfactions it provides. Many physical activities are enjoyable in their own right, and require no exogenous rewards or incentives to be performed (Ryan & Deci, 2000a). In contrast, extrinsic motivation characterizes activities that are performed in order to obtain some separable outcome, whether that is a tangible reward, an avoidance of a punishment, or the attainment of recognition or approval. By definition all intentional acts are motivated, either intrinsically or extrinsically. In the domain of physical activity there are frequently cases where a person has no intention to act, which is referred to as amotivation. Reasons identified for being amotivated is that the person does not experience a sense of competence to carry out the activity. This could be due to lack of skills or knowledge to carry out the act. Another basis for amotivation is the lack of connection between the action and desired outcomes. Finally, an individual may not want to act because there is no value or interest associated with the activity (Ryan, Williams, Patrick, & Deci, 2009). By fostering competence or efficacy this could help a person discover meaning or value (thus fostering internalization) or interest and enjoyment (thus fostering intrinsic motivation) in an activity. Fulfilling basic psychological needs for autonomy, competence, and relatedness an individual's goal missions can be linked to motivation. In the domain of physical activity the principle contrast between extrinsic and intrinsic goals is that between the goals of becoming healthy and fit (intrinsic) and looking good to others (extrinsic) (Ryan & Deci, 2000). Individuals pursuing health goals will be more persistent and experience greater well-being than those pursuing attractiveness goals (Ryan & Deci, 2000). Vansteenkiste,

Simons, Lens, Sheldon, and Oeci (2004) performed an experimental study in the context of physical education classes for 10-12th grade Belgian students and found that framing an exercise activity in terms of an intrinsic goal attainment (i.e., "This activity helps you to remain physically fit and prevents you from becoming sick at a later age") increased performance compared to extrinsic goal framing (i.e., "Doing this activity helps you to remain physically appealing to others and prevents you from gaining weight at a later age"). Intrinsic goals or aspirations are those assumed to be inherently satisfying and to foster need fulfillment directly. Intrinsic goals include goals such as developing intimate relationships, building community, growing personally and maintaining one's health. In contrast, extrinsic goals are focused on outcomes that are themselves not inherently satisfying of basic needs, and instead are bases for feeling contingently regarded or worthy. Extrinsic goals include those for money and material goods, fame and popularity, and having an attractive image. A research study (Kasser & Ryan, 1996) has shown that intrinsic goals or aspirations are a critical factor in adherence to physical activity and exercise with implications that extrinsic goals are not sufficient to sustain adherence to physical activity and exercise.

Frederick and Ryan (1993) surveyed 376 adults using the Motivation for Physical Activities Measure (MPAM) and found results that suggest that an individual who exercises for intrinsic reasons is more likely to feel energized, confident, and satisfied in their physical activity, whereas extrinsic reasons may not facilitate these results. Intrinsic motivation is critical for adherence. Brawley and Vallerand (1984) argued that many individuals participate in fitness programs for external reasons such as losing weight or feeling more attractive. The researchers further speculated that these extrinsic reasons for

participation may be related to poor adherence rates to the extent that extrinsically focused individuals may derive less enjoyment from the activity itself. Wankel (1993) similarly views intrinsic motivation as a key factor in exercise adherence, suggesting that spontaneous enjoyment of an activity leads to increased persistence and to reduced stress and positive psychological feelings.

MINDFULNESS BASED STRESS REDUCTION

Mindfulness-based stress reduction (MBSR) is a westernized secular development of the Buddhist practice of meditation. The strategies of the Mindfulness Based Stress Reduction (MBSR) program were developed from the Buddhist principals of mindfulness meditation – to alleviate suffering and cultivate compassion in the universe. Mindfulness refers to a meditation practice that cultivates moment to moment awareness of internal and external conditions. This moment to moment awareness incorporates the disengaging of oneself from attachment to thoughts and emotions developing a greater sense of emotional balance and well-being. Mindfulness is supported by the premise that attending to physical and emotional experiences in a nonjudgmental way fosters greater attention capacity, clear thinking, and compassion. Mindfulness involves an awareness of internal and external foci including thoughts, emotions, physical sensations, actions, and reactions. Mindfulness diminishes impulsive reactions by allowing our senses to enter into awareness of what is taking place in a nonjudgmental facet. When engaged in mindful awareness an individual is aware of thoughts as simply thoughts, actions as actions, that are to be observed and this promotes the cultivation of insight into self, others, and the human condition. Mindfulness can only be understood from the inside

out. It is not just one more cognitive-behavioral technique to be deployed in a behavior change paradigm, but a way of being and way of seeing that has profound implications for understanding the nature of our own minds and bodies, and for living life as if it really mattered (Jon Kabat-Zinn, 2011).

Buddhist meditative practices are concerned with attention and awareness and the cultivation of compassion as does the secular westernized contemporary MBSR program. Jon Kabat-Zinn stated “For me one primary and compelling reason for attempting to bring mindfulness into the mainstream of society was to relieve suffering and catalyze greater compassion and wisdom in our lives and culture” (Jon Kabat-Zinn, 2011). In addition to improved psychological health, reduced perception of anxiety, stress, and degree of pain the MBSR program includes a financial cost benefit. When comparing outpatient medical care 6 months prior to and 6 months post taking the MBSR course patients experienced a 3-fold reduction in average medical charges per MBSR patient versus patients who did not complete the program (J. Kabat-Zinn, et al., 1987). Similarly in a study performed by Tate, 1994, showed a 60% decrease in outpatient clinic visits, 50% decrease in length of hospital stays, and 90% reduction in work absenteeism for MBSR patients.

Mindfulness Based Stress Reduction intervention models have been used in college and community settings. In the MBSR program mindfulness cultivation is the central focus of the intervention whereas with Acceptance Commitment Therapy mindfulness is a part of several fundamental points of the intervention. Acceptance and commitment therapy (ACT) teaches individuals to accept their feelings, to “defuse” or disengage from the content of their thoughts by focusing more mindfully on the process

of thinking itself, and to link all of this to goal-based action (Hayes, Strosahl, & Wilson, 1999). MBSR and ACT interventions have been applied to stressed populations within both the college and community settings as well as healthy populations. (Shapiro, Schwartz, & Bonner, 1998) reported that premedical and medical students randomly assigned to mindfulness training, compared with a wait-list control group showed reduced psychological distress and increased empathy. (Oman, Shapiro, Thoresen, Plante, & Flinders, 2008) evaluated the effects on stress, rumination, forgiveness, and hope on college undergraduates allocated to the MBSR program. The ACT program has been used in a study (Tapper et al., 2009) examining the effects of an acceptance commitment therapy mindfulness based weight loss intervention for women this randomized controlled study showed greater reductions in body mass index (BMI) and increased physical activity relative to controls.

Despite the well-known health benefits of physical activity most adults are leading sedentary lifestyles. The ten most common reasons adults cite for not adopting more physically active lifestyles are represented in Table 1 (Sallis & Hovell, 1990). Mindfulness meditation has profound transformative potential on the nature of the human heart and mind in the search to examine and determine physical and mental health values. Research suggests that perceived stress plays an important role between health and inactivity.

Table 1. *10 Most Common Reasons Cited for Inactivity*

-
-
- Do not have enough time to exercise
 - Find it inconvenient to exercise
 - Lack self-motivation
 - Do not find exercise enjoyable
 - Find exercise boring
 - Lack confidence in their ability to be physically active (low self-efficacy)
 - Lack self-management skills, such as the ability to set personal goals, monitor progress, or reward progress toward such goals
 - Lack encouragement, support, or companionship from family and friends,
 - Do not have parks, sidewalks, bicycle trails, or safe and pleasant walking paths convenient to their homes or offices.
-

Source: Sallis, J. F., & Hovell, M. F. (1990). Determinants of exercise behavior. *Exercise & Sport Sciences Reviews*, 18, 307-330.

The goal of mindfulness meditation practice is to reduce stress and suffering by developing equanimity in the mind and body, as well as insight into the mental and physical conditions that inhibit an individual's capacity to respond pro-actively and effectively to everyday events (Matousek, Dobkin, & Pruessner, 2010). The practice of mindfulness meditation helped study participants to reduce their perception of stress, maintain non-judgmental awareness during different situations, and experience higher levels of positive states of mind (Chang et al., 2004). The findings from this study provide a leverage of support for the usage of mindfulness meditation in a physical activity intervention as a fundamental basis to assist adults in discontinuance of yielding to negative states of mind affecting allocation of thoughts for health promoting behaviors. Negative state of mind is primary organizational core of cited reasons why adults do not adopt a more physically active lifestyle. Higher levels of positive states of mind can be useful in counteracting negative thoughts and behaviors like, lack of self-motivation,

confidence in their ability to be physically active, not finding exercise enjoyable, and finding exercise boring as indicated in Table 1. Patients in a low-income community health center with Type 2 diabetes taking a one-day education workshop as part of their diabetes medical management were randomly assigned either to education alone or to a combination of education and (ACT). Both groups were taught how to manage their diabetes, but those in the ACT condition also learned to apply acceptance and mindfulness skills to difficult diabetes-related thoughts and feelings. In the education condition, 10 of 38 participants were initially in diabetic control. At follow-up, 3 of these were no longer in control, and 2 of the remaining 28 participants were. In the ACT condition, 11 of 43 participants were in control at pre-assessment. At follow-up, 1 of these was no longer in control, and 11 of the remaining 32 participants were. Changes in self-management were statistically significant for the ACT group over the education alone. (Gregg, Callaghan, Hayes, & Glenn-Lawson, 2007). There are practical advantages to mindfulness as a method of dealing with the lack self-management skills, such as the ability to set personal goals, monitor progress, or reward progress toward such goals cited as one the common reasons for inactivity.

Evidence to Support Implementation of Mindfulness in Physical Education Programming

There is considerable research that supports why mindfulness training may be beneficial to implement in higher education physical and health education programs. There is empirical evidence that mindfulness awareness produces beneficial outcomes of psychological well-being, reduction in perceived stress, improved quality of life, and

enhancement of cognition in individuals who function within a level of mindfulness. The opposite of a mindful person is a person whose mind is full, a mind full of thoughts and perceptions that foster counterproductive arousal stimuli that diminish attentional resources. Kahneman's model of attention (Figure 1) provides a theoretical framework explaining the mechanism of limited attention capacity (Magill, 2004).

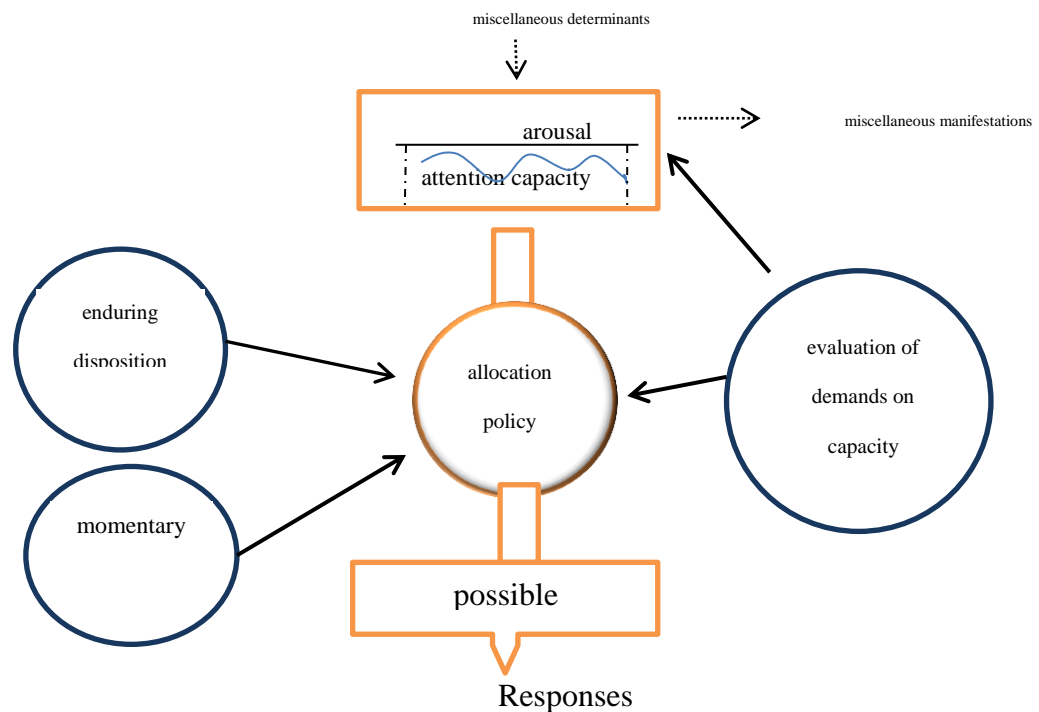


Figure 1. *Kahneman's model of attention*

Kahneman views the available attention that a person can give to an activity or activities as a pool of capacity resources, this employs cognitive resources necessary to carry out activities. This central mental pool of resources of human attention is limited, but in Kahneman's model the attention capacity resources are flexible. This means that the amount of attention fluctuates depending on the individual, the tasks being performed, and the situation. This flexibility is indicated by the wavy line in the model. This

attention capacity can be subdivided for times when there is a need to direct attention to several activities or to a single activity. Allocation of these attention capacity resources is determined by the activities and the allocation policy of the individual, which in turn is influenced by situations that are internal and external to the person. Mindfulness techniques taught in a PHED instructional course can be used as an operational consciousness that supports the allocation policy through the critical factors of arousal and evaluation of demands on capacity indicated in the model.

In viewing Kahneman's model the attention capacity will increase or decrease according to the arousal level of the person. Arousal is defined as a state of excitability indicated in a person's activation levels of their emotional, mental, and physiological systems. Mindfulness represents an open unbiased awareness of and attention to internal experience and the environment. Mindfulness offers an unbiased display of what is taking place allowing a person to process information in an unbiased non-judgmental awareness thereby allowing greater opportunity for leveling arousal, maximizing and individual's attention capacity and allocation of attention policy. Mindfulness contributes to an enhancement of an optimal arousal level by assisting in narrowing competing attentions. In order for a person to have the maximum attention resources available, the person must be at an optimal arousal level if arousal levels are too low or too high maximum attention capacity is not obtained, graphically shown in Figure 2.

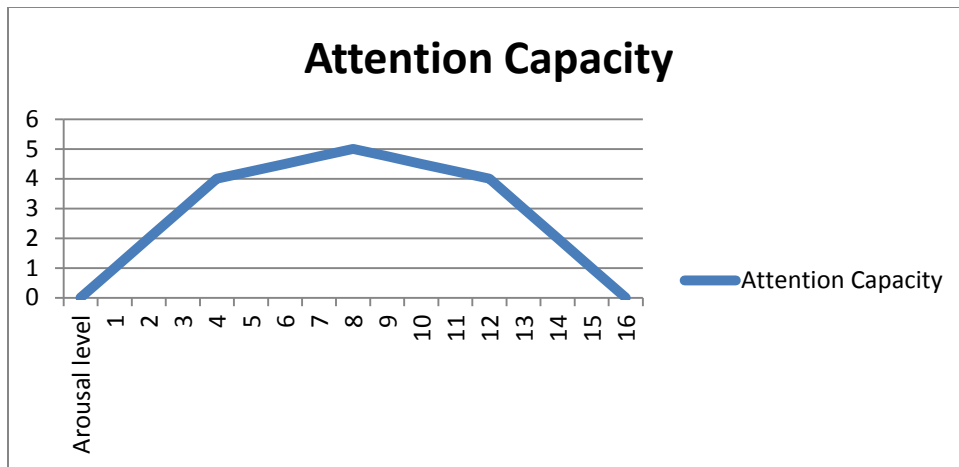


Figure 2. *Attention Capacity*

The available attention resources are allocated to possible activities and this is determined by the allocation policy, represented in Kahneman’s model. There are three factors that affect allocation of policy. One is that we allocate attentional resources according to our enduring dispositions –involuntary attention- in other words things that distract us. These distractions can be visual or audible. Mindfulness enhances an individual’s ability to disengage from a distracting visual or audible object for a greater selection of attentional resources to be used in the activity determined by the allocation policy. In a study presented at the SEACSM conference the researchers noted that college students reported an ability to simply observe a distracting noise allowing it to be while not get carried away with the distraction of the noise during an assessment.

Secondly momentary intentions can affect the allocation policy. Momentary intentions involve a person’s allocation of attention in a situation according to his or her specific intentions. Mindfulness strengthens momentary intentions through mindfulness practices of breathing meditations and body scans which can be self-directed or guided through instruction. Students enrolled in PHED stress reduction course at Auburn

University reported being able to be more present during lectures and while studying and noticed a reduction in their attention being distracted (Sandage & Exford, 2011). The core of mindfulness an abiding awareness of what is taking place is an observant state that precisely aids in the third factor affecting allocation policy, the evaluation of demands on capacity.

Mindfulness allows an individual to decrease reactive responses by teaching individuals to view thoughts as thoughts and that these thoughts do not necessarily require action thus minimizing “knee jerk” reactions. Mindfulness leads to a decrease in reactive responses by increasing non-judgmental observation to support evaluation of demands on capacity. This evaluation can be more clearly and fully informed and the awareness of the requirements of the task to be performed can be mindfully assessed - lowering impulsiveness. The attention capacity is optimized so that the allocation policy can proceed with optimal attentional recourses for the determined activity.

With the determined activity having been made in the company of an optimal arousal level for sufficient attention resources the end response leads a person to achievement of a high level of performance. This performance can be manifested as healthy habits, for example increased physical activity or healthy food selection, stress reduction, increased cognitive abilities, or a positive change in health behaviors that allow individuals to in engage in a more healthy lifestyle.

Summary

The preceding literature review supports the association that physical activity is an important factor to combat the obesity epidemic, and promote health benefits and healthy lifestyle habits for adults. Furthermore, the research reviewed support the concept that there are practical advantages to mindfulness as a method of dealing with the changes of physical inactivity. The potential link between mindfulness meditation and human health appears to be gaining more attention and interest among researchers and practitioners.

The purpose of this study was to examine to assess the effectiveness of a 15 week curriculum based physical activity intervention on increasing physical activity levels, mindfulness, and reducing perceived stress of college students. It was expected that college students receiving mindfulness instruction would demonstrate a higher daily step count, increase in mindfulness, and a reduction in perceived stress. The following section will explain the methodology of this study.

Chapter III

Method

The purpose of the study was to assess the effectiveness of a 15 week curriculum based physical activity intervention on increasing physical activity levels, mindfulness, and reducing perceived stress of college students. This chapter presents the methodology for the study and consists of the following sections: (a) participants, (b) instruments, (c) procedures and design, and (d) data analysis.

Participants

The study population was selected from college students enrolled in a walking for fitness physical and health education instruction course at Auburn University. Permission had been granted from the Physical Activity & Wellness Program (PAWP) Graduate Teaching Assistant Coordinator Dr. Jared Russell to recruit research participants. Approval from the Auburn University Institutional Review Board for Human subjects was granted. Auburn University is a large southeastern land-grant research university. The student population of Auburn University has a total enrollment of 25,078 with undergraduate students representing 81% of the student population. The demographics of undergraduates by gender are 51% males, 49% females. By class level 21% freshman, 17% sophomore, 18% junior, and 24% seniors and 5th year. By ethnicity 69% Caucasian, 6% Black, <1% American Indian or Alaskan, 2% Asian or Pacific Island, 2% Hispanic, <1% Non-Resident Alien, and <1% Unknown. The demographics of the PHED walking for fitness course were expected to reflect the demographics of Auburn University by

class level and ethnicity but not by gender as females historically have enrolled in walking fitness courses in greater percentages than males. The demographics for the walking for fitness course as indicated by the class roster have a total enrollment of 50 students: 34 females (68%) with 16 (32%) males. By ethnicity 78% Caucasian (39), 18% Black (9), 2% American Indian or Alaskan (1), and 2% Asian or Pacific Island (1). A summary of descriptive information of the sample by ethnicity is presented in Table 2. The male demographics by class level were (0) freshman, (3) sophomore, (3) juniors, (9) seniors, and (1) 2nd degree. For females (3) freshman, (9) sophomore, (3) juniors, (1), (18) seniors and (1) 2nd degree. Demographics by class level for the entire enrollment was 6% freshman, 24% sophomore, 12% junior, and 54% seniors and 4% 2nd degree. A summary of descriptive information of the sample by gender and class level is presented in Table 3. Students enrolled in the PHED Walking Fitness completed the online surveys and wore the Omron pedometers as a part of the course requirement while only those students consenting to participate in the research were reviewed in the statistical analysis of data.

Table 2. *Participant's Demographic Information*

Participants	<i>n</i>	Percentages	Auburn University <i>n</i>	Percentages
Caucasian	39	78%	20,829	69%
Black	9	18%	1935	6%
American Indian or Alaskan	1	2%	165	1%
Asian or Pacific Island	1	2%	511	2%

Table 3. *Participant's Demographic Information by Gender and Class Level*

Participants	<i>n</i>	Percentages of total Participants	Auburn University <i>n</i>	Percentages of Auburn University Students
Male	16	32%	12,889	51%
Females	34	68%	12,580	49%
Freshman		6%		25%
<i>male</i>	0		2556	
<i>female</i>	3		2574	
Sophomore		24%		23%
<i>male</i>	3		2303	
<i>female</i>	9		2316	
Junior		12%		22%
<i>male</i>	3		2305	
<i>female</i>	3		2226	
Senior		54%		30%
<i>male</i>	9		3266	
<i>female</i>	18		2900	
2nd degree		4%		NA
<i>male</i>	1		NA	
<i>female</i>	1		NA	

All of the students enrolled in the Walking for Fitness Course were invited to participate. Of the 50 students enrolled all 50 consented to participation. Of those students who volunteered to participate 41 (82%) students completed the course. Thirty-four (34) of the students that completed the course were used in the analysis of the findings. Participants were randomly assigned to a control or intervention group. The control group received instruction associated with the development and maintenance of cardio-respiratory fitness through a walking exercise program. The intervention group received instruction associated with the development and maintenance of cardio-respiratory fitness through a walking exercise program and instruction in stress reduction

employing mindfulness meditation techniques. Stratified random sampling was used to ensure that each group was represented proportionally by gender.

None of the participants were excluded from the study. Exclusion criterion established included, participants with missing baseline, post, or more than one pedometer data collection week (i.e. data collection for both weeks 4 and 8) were to be excluded from the study. Of the participants excluded, two (2) were missing post pedometer data collection and four (4) had more than one pedometer data collection week missing. Participants with pedometer data less than 4 days were to be excluded from the study. Tudor-Locke et al (2005) suggested that a single day of step monitoring is not acceptable but that 3 days provide a sufficient estimate. Participants who accrued eight (8) absences were to be excluded from the study this criterion is based on the Physical Activity and Wellness Program (PAWP) Attendance Policy. Students missing more than 3 consecutive class meetings were to be excluded from the study. Those participants initially assigned to the control group were offered the opportunity to participate in a stress reduction session during the summer semester of 2012.

Instruments

Data was collected through student submission of an online survey and through students wearing a pedometer. Surveys allow for a standardization of information, the same information can be collected from each respondent. An advantage of using web-based surveys is the reduction in cost, no paper usage, mailing, or data entry cost. The time for implementation of the tool is reduced and it affords the convenience of privacy for respondents when completing the survey. Survey data demographic information collected included gender, level, ethnicity, age range, and college/school, reason for

course enrollment, experience in meditation practices. Survey Monkey is an internet survey application developed to conduct, manage, and analyze research and was used to send a unique survey link through a message delivered by Survey Monkey's mail server. The researcher was able to then track who had responded, who had not responded, who opted out, etc.

Perceived Stress Scale

The Perceived Stress Scale (PSS) survey is a 10-item instrument that uses a 5-point Likert scale (Appendix A). The Perceived Stress Scale is used as psychological instrument for measuring the perception of stress. It is a measure of the degree to which situations in one's life are appraised as stressful. Items were designed to determine how unpredictable, uncontrollable, and overloaded respondents find their lives. The scale also includes a number of direct queries about current levels of experienced stress. Moreover, the questions are of a general nature and hence are relatively free of content specific to any sub-population group. The questions in the PSS ask about feelings and thoughts during the last month. In each case, respondents are asked how often they felt a certain way. PSS scores are obtained by reversing responses (e.g., 0 = 4, 1 = 3, 2 = 2, 3 = 1 & 4 = 0) to the four positively stated items (items 4, 5, 7, & 8) and then summing across all scale items (Cohen, Kamarck, & Mermelstein, 1983).

Evidence for validity showed that higher PSS scores were associated with (for example): failure to quit smoking, failure among diabetics to control blood sugar levels, greater vulnerability to stressful life-event-elicited depressive symptoms, and more colds. Health status relationship to PSS reported by Cohen et al. (1983) show correlations with

PSS and stress measures, self-reported health and health services measures, health behavior measures, smoking status, and help seeking behavior.

Kentucky Inventory of Mindfulness Skills

The Kentucky Inventory of Mindfulness Skills (KIMS) survey is a 39-item instrument that uses a 5-point Likert scale (Appendix B). The 4 factors measured representing elements of mindfulness are (1) observing or attending to sensations, perceptions, thoughts, and feelings; (2) describing or non-judgmental labeling of these internal experiences with words; (3) acting with awareness rather than on “automatic pilot”; and (4) accepting without judgment accepting, allowing, or being nonjudgmental or non-evaluative about present moment experience.

The KIMS is used to assess 4 mindfulness skills as previously described. Observing mindfulness involves observing, noticing or attending to various stimuli including internal phenomena (cognitions, bodily sensations) and external phenomena (sounds, smells) is measured in items: 1, 5, 9, 13, 17, 21, 25, 29, 30, 33, 37, 39. Describing involves participant describing, labeling, or noting of observed phenomena by applying words in a nonjudgmental way is measured in items: 2, 6, 10, 14, 18, 22, 26, 34. Acting with awareness being attentive and engaging fully in one’s current activity is measured in items: 3,7, 11, 15, 19, 23, 27, 31, 35, 38. Accepting (or allowing) without judgment to allow reality or what is there, to be as it is without judging, avoiding, changing, or escaping it is measured in items: 4, 8, 12, 16, 20,24, 28, 32, 36. Scoring items are rated on a 5 point Likert scale ranging from 1 (never or very rarely true) to 5 (almost always or always true). Items reflect either direct descriptions of the mindfulness skills, or they describe the absence of that skill and are reverse scored. High scores reflect

more mindfulness. With respect to reliability the instrument has good internal consistency. Alpha coefficients for observe, describe, act with awareness and accept without judgment were .91, .84, .76, and .87, respectively. There is adequate to good test-retest reliability with correlations for the factors observe, describe, act and accept scores being .65, .81, .86, and .83, respectively. The KIMS demonstrates good content validity and has good concurrent validity, correlating with the Mindfulness Attention Awareness Scale (MAAS: Brown & Ryan, 2003). (Refer to Table 4).

Table 4. *Results of Reliability Analysis of Current Study and Original Studies Cited*

Scale	Number of Items	Cronbach's Alpha	Cronbach's Alpha (Baer, Smith, & Allen, 2004) *(Cohen & Williams, 1988)
KIMS subscale <i>Observe</i>	12	.81	.91
KIMS subscale <i>Describe</i>	8	.92	.8
KIMS subscale <i>Acting with Awareness</i>	10	.88	.76
KIMS subscale <i>Acceptance without Judgment</i>	9	.82	.87
Perceived Stress Scale	10	.88	.78*

Physical Activity - Pedometers

Researchers have used a range of different measurement tools and protocols in both laboratory and fields studies to measure physical activity. These tools are commonly divided into objective (e.g. doubly labeled water (DLW), direct observation, heart rate, monitoring, and motion sensors such as accelerometers and pedometers) and subjective

methods (e.g, questionnaires) (Hands & Larkin, 2006; Hussey, Bell, & Gormley, 2007; Sirard & Pate, 2001).

Motion sensors are gaining credibility in physical activity research. One kind of motion sensor is the pedometer. This particular measurement records in steps the acceleration and deceleration of the waist in the vertical direction (Hussey et al., 2007), and provide valid assessments of the total volume of physical activity. They are easy to use, inexpensive, re-usable, objective, nonreactive, and are ideally suited to large-scale studies. A pedometer is a better measure of physical activity in adults when engaged in a cardiorespiratory walking program compared to the accelerometer. This instrument reports correlations between .73 and .79 for 3 to 4 days of monitoring.

The participants daily step count and aerobic step count in this study were measured using the Omron HJ-720 ITC pedometer. This is an electronic monitor that records step counts on both vertical and horizontal planes. This device offers many advantages such as it can be worn either in a pocket or clipped to a belt, records and stores information in its memory for 42 days, resets automatically at midnight, and cannot be zeroed manually. Other advantages for the monitor is that it measures the dimension of intensity (aerobic steps, achieved at moderate intensity level = 3 METs), and records the amount of time spent in moderate-to-vigorous physical activity. A field test 20-steps count was conducted to validate that the pedometer works appropriately and to assess measurement error. The pedometer was calibrated for each participant (stride length and weight) and each participant was given verbal instructions on how to wear and use the pedometer. Figure 3 illustrates how the participants wore the pedometer. This pedometer has been tested for validity in prescribed and self-paced walking and

demonstrates an absolute percent error of < 3.0% (Holbrook, Barreira, & Kang, 2009).

Figure 3. *Photograph of Participant Wearing Pedometer*



Procedure

Approval from the Auburn University Institutional Review Board for Human subjects was submitted. Permission was granted from the Physical Activity & Wellness Program (PAWP) Graduate Teaching Assistant Coordinator Dr. Jared Russell to develop a walking curriculum in conjunction with an adaptation of the mindfulness based stress reduction (MBSR) course to be implemented as a part of the PHED walking course. The researcher visited the Walking for Fitness class during the first class meeting at Auburn University where undergraduate students were enrolled to provide them the option to participate in the research study. As a part of course requirements students were required to wear a pedometer for a week at four set points (week 1, week 4, week 8, & week 13) during the semester and complete online surveys on the first day of distribution of the pedometers for each distribution set point. The students completing consent forms (Appendix D) to participate in the study were randomly stratified to ensure that each

group were represented proportionally by gender and assigned to the control or intervention group. Students assigned to the control group and the intervention groups were notified by email of the location of the 2nd class meeting which remained the same for the duration of the course. Non-consenting students met at same location of the control group. Each group received the walking program from either the course instructor or the mindfulness instructor.

During the first class meeting student's weight and stride length were measured for the pedometer. The pedometer was calibrated for each participant (stride length and weight) and each participant was given verbal instructions on how to wear and use the pedometer at the time of pedometer distribution during the 2nd class meeting and all subsequent distribution set points. The Omron HJ-720 ITC pedometer was distributed to each student and students were asked to wear the pedometer for one week (five week days and two weekend days) during waking hours. Students received a demonstration and explanation on how to wear the monitor and how and when to remove it (i.e., only during showering, bathing, swimming or sleeping). Students were given the researchers contact information, at the time of distribution, in the event of malfunction or loss of the pedometer to receive a replacement unit to complete the physical activity measurements. At the end of the data collection point (Wednesday – Wednesday) the researcher collected the pedometers from the students. The pedometer data was transferred to the researcher's computer. Students with pedometer data <4 days did not receive credit for the physical activity measurement. Exclusion of physical activity measurements for study participants aligned with the course requirements in addition to participants with missing baseline, post, or more than one pedometer data collection week (i.e. data collection for

both weeks 4 and 8) were excluded from the study.

The first day of pedometer distribution for each set point (week 1, week 4, week 8, and week 13) students completed, online a demographic survey, the Kentucky Inventory of Mindfulness Skills survey and the Perceived Stress Survey. An email providing a link to the online surveys was sent to students using the Auburn University email address of each student. Email is recognized as an official means of communication at Auburn University. All students are assigned an AU user name and have access to email communications. The Survey Monkey mail server delivered the message and the system automatically generated unique links. Each unique link was tied to a specific email address in the list via the tags (first and last name of student) included in the default message. Only the recipient knew his/her unique link. As the survey creator, the researcher was not able to see each assigned link inside the collector. As a person responded, his or her email was populated on the response in the Analyze section and tracked by status in the collector. If the surveys were not completed by the deadline (10pm on day of pedometer distribution) indicated on the syllabus and in the email containing the link a reminder email was redistributed (8am the day following distribution of pedometer). Table 5 presents the schedule that was used in data collection.

Table 5. *Data Collection Schedule*

<u>Data Collection Points for Pedometer Measures and Surveys</u>	
Data collection point 1	- Jan. 11 – Jan. 18
Data collection point 2	- Feb. 1 – Feb. 8
Data collection point 3	- Feb. 29 – Mar. 7
Data collection point 4	- Apr. 11 – Apr. 18

Walking for Fitness Curriculum

The purpose of the walking for fitness course was for the student to develop an understanding of the basic concepts of exercise terminology, the health benefits associated with exercise, stretching techniques to prepare for exercise, and to introduce walking as lifelong physical program. As a course requirement all students completed an online textbook and tracking system for physical and health education courses. This tracking portal system contained material covering exercise vocabulary, health benefits of exercise, the FITT principle, behavior change, preparing and recovering from exercise, and an activity profile. During the course scheduled meeting time students in the control group participated in 15 minutes of stretching at the beginning of class and concluded the class with 30 minutes of walking. The walking program alternated for the two groups. The walking course activity curriculum is presented in (Appendix E).

Mindfulness Curriculum

The purpose of the stress reduction curriculum was for the student to develop an understanding of the basic concepts of mindfulness-based stress reduction, methods that can be used to reduce overall life stress, and basic mindful practice in guided classroom activities. The intervention started with body awareness meditation, and was followed by sitting meditation with a focus on sensory objects of awareness, breathing awareness, sounds, body sensations, thoughts and a loving kindness mantra meditation focus, this curriculum is presented in (Appendix F). During the course scheduled meeting time, students in the mindfulness group participated in 15 minutes of mindfulness meditation at the beginning of class and concluded the class with 30 minutes of walking.

Instructions for the 30 minute walking program were administered by the mindfulness instructor. The walking program alternated for the two groups.

Data Analysis

Data was subjected to 3, 2 (Groups) X 4 (Time) repeated measures analysis of variance (ANOVA), mixed between–within–subjects ANOVAs with alpha set a priori at .05. This mixed between–within–subjects ANOVAs combine between-subjects and within-subjects design. In this study the mixed between–within–subjects ANOVAs examined the differences in physical activity levels, perceived stress, and mindfulness that existed between time (baseline, 4th week, 8th week, and post) under different conditions: control group or MBSR intervention group and interaction effect.

The three ANOVAs were conducted to address the research hypotheses associated with physical activity levels, perceived stress, mindfulness, and interaction effect of MBSR intervention and control group over time (pre, 4 week, 8week, and post) for physical activity, mindfulness, and perceived stress.. These hypotheses predicted that: (a) students who receive the mindfulness based stress reduction instruction as a part of the cardiorespiratory walking for fitness instruction will show an increase in physical activity levels above the control group receiving only the cardiorespiratory walking for fitness instruction, (b) students who receive the mindfulness based stress reduction instruction as a part of the cardiorespiratory walking for fitness instruction will show an increase in mindfulness above the control group receiving only the cardiorespiratory walking for fitness instruction, (c) students who receive the mindfulness based stress reduction instruction as a part of the cardiorespiratory walking for fitness instruction will show a

decrease of perceived stress above the control group receiving only the cardiorespiratory walking for fitness instruction, (d) There will be a difference between the MBSR intervention and control group over time (pre, 4 week, 8week, and post) for physical activity, mindfulness, and perceived stress.

Data screening and analyses were conducted using Microsoft Excel and SPSS, version 18.0 (SPSS, Inc., Chicago, IL). Prior to conducting the analyses, the quantitative assessment scoring followed the protocol specific to each measure. The initial step in preparing the quantitative data was to assemble the raw scores from all assessment that was associated with participants at each data point. Several assessments contained questions that were reversed scored and the means were calculated across all scale items.

Chapter IV

Results

The purpose of the study was to assess the effectiveness of a 15 week curriculum based physical activity intervention on increasing physical activity levels, mindfulness, and reducing perceived stress of college students. It was hypothesized that (a) students who received the mindfulness based stress reduction instruction as a part of the cardiorespiratory walking for fitness instruction would show an increase in physical activity levels above the control group receiving only the cardiorespiratory walking for fitness instruction, (b) students who received the mindfulness based stress reduction instruction as a part of the cardiorespiratory walking for fitness instruction would show a decrease of perceived stress above the control group receiving only the cardiorespiratory walking for fitness instruction, (c) students who received the mindfulness based stress reduction instruction as a part of the cardiorespiratory walking for fitness instruction would show an increase in mindfulness above the control group receiving only the cardiorespiratory walking for fitness instruction, and (d) there would be a difference between the MBSR intervention and control group over time (pre, 4 week, 8week, and post) for physical activity, mindfulness, and perceived stress.

The following chapter presents results of the current study and includes the following: descriptive statistics of the participants, and three additional sections (a) average daily pedometer step count over time (pre, 4 week, 8week, and post), (b) perceived stress scores over time (pre, 4 week, 8week, and post), and mindfulness scores over time (pre, 4 week, 8week, and post). Group differences are reported within these four sections.

Descriptive statistics for gender, age, class level, and ethnicity for percentage (p), and number of participants (n) can be found in Table 6.

Table 6. *Participant's Used in Analysis Demographic Information by Gender, Age, Class Level, and Ethnicity*

Participants	Number of Participants (N)	Percentage (p)
Gender	34	
Male	10	29%
Female	24	71%
Age		
19	8	24%
20	7	21%
21	6	18%
22	9	26%
23	3	8%
26-30	1	3%
Class Level		
Freshman	2	6%
Sophomore	10	29%
Junior	4	12%
Senior	18	53%
Ethnicity		
Caucasian	26	76%
Black	6	18%
American Indian or Alaskan		
Asian or Pacific Island	1	3%
	1	3%

Pedometer Average Step – Physical Activity Measure

The following presents the results of the statistical analysis examining the hypothesis of students who receive the mindfulness based stress reduction instruction as a part of the cardiorespiratory walking for fitness instruction will show an increase in physical activity levels above the control group receiving only the cardiorespiratory walking for fitness instruction. The subsequent information presents the results of the mixed between-within-subjects analysis of variance for measures of physical activity on daily step count, for repeated measures collected for one week during each data collection point (for pre, 4th week, 8th week, and post), among the college students based on the group: control or MBSR intervention group.

Prior to conducting the analysis, data were screened to ensure that the assumptions of this mixed design were fulfilled. Descriptive statistics, including skewness and kurtosis coefficients histograms, and normal Q-Q plots, were examined for pre, 4th week, 8th week, and post for both the control and intervention group. These measures and plots showed that the assumption of normality was fulfilled on the four measures of physical activity across groups. In addition, the results of Mauchly's W test show that the assumption of sphericity is met (Mauchly's $W = .964$, $\chi^2_{(df=5)} = 1.12$, $p > .05$). The results of the Levene's test of equality of variances ($p > .05$) and Box's M test ($F = 1.18$, $p > .05$) show that the assumptions of both homogeneity of variances and homogeneity of covariance matrices, respectively, were fulfilled.

A two-way repeated measures of ANOVA was utilized to examine the differences between pre, 4th week, 8th week, and post physical activity levels among the college students and whether these measures are different based on group.

Within-Subjects Effect: The results of the two-way ANOVA tests of within-subjects show a significant difference between Time (pre, 4th week, 8th week, and post physical activity levels) ($F_{(df = 3,96)} = 3.62, p > .05, \eta^2 = .10$) (Refer to Table 7). A repeated measures t test was utilized to examine the differences between pre, 4th week, 8th week, and post physical activity levels among the college students within the control and intervention groups. The results of the t test show a significant change between pre and 4th week physical activity levels and 4th and 8th week physical activity levels in the control group. The results show a significant increase in physical activity levels from pre (mean = 6134, SD = 2341) to the 4th week $M = 6982, SD = 2416, t(34) = -2.64, p < .05, d = .45$, wherein there is a significant decrease in physical activity levels from the 4th week (mean = 6826, SD = 2266) to the 8th week ($M = 5892, SD = 1970, t(33) = 2.93, p < .05, d = .50$).

Table 7. Results of Two-Way Repeated Measure ANOVA Physical Activity Summary

Physical Activity – Total Steps	Week1 Mean (SD)	Week4 Mean (SD)	Week8 Mean (SD)	Post Mean (SD)	F (Group)	F (Time)	F (Group X Time)
Group	5979 (2132)	6879 (2266)	5887 (1970)	6112 (1945)	.10	3.62	.39
Control	6089 (2181)	7180 (2575)	5863 (1868)	6115 (2238)			
Intervention	5868 (2148)	6578 (2055)	5912 (2087)	6108 (1773)			

Table 8. Results of t-Test on Physical Activity Summary

Physical Activity – Total Steps	Week1 Mean (SD)	Week4 Mean (SD)	Week8 Mean (SD)	t	df
Pre – 4 th week	6134 (2341)	6982 (2416)		-2.65	34
4 th – 8 th week		6826 (2266)	5892 (1970)	2.93	33

Between-Subjects Effect: The results of the two-way ANOVA tests of between-subjects show no significant difference between the control and intervention group on physical activity levels ($F_{(df=1,32)} = .103, p > .05, \eta^2 = .003$). Overall, the results show that group did not contribute any percentage to the variance in physical activity levels (Refer to Table 8).

Interaction effect: The results of the two-way ANOVA tests of with-in subjects effects show no significant interaction between time and group on physical activity levels ($F_{(df=3,96)} = .39, p > .05, \eta^2 = .01$).

Kentucky Inventory of Mindfulness Skills – Mindfulness Measure

The following presents the results of the statistical analysis examining the hypothesis of students who receive the mindfulness based stress reduction instruction as a part of the cardiorespiratory walking for fitness instruction will show an increase in

mindfulness above the control group receiving only the cardiorespiratory walking for fitness instruction. The following presents the results of the mixed between-within-subjects analysis of variance for measures of mindfulness on daily step count, for repeated measures collected for one week during each data collection point (for pre, 4th week, 8th week, and post), among the college students based on the group: control or MBSR intervention group.

Prior to conducting the analysis, data were screened to ensure that the assumptions of this mixed design were fulfilled. Descriptive statistics, including skewness and kurtosis coefficients histograms, and normal Q-Q plots, were examined for pre, 4th week, 8th week, and post for both the control and intervention group. These measures and plots showed that the assumption of normality was fulfilled on the four measures of mindfulness across groups. In addition, the results of Mauchly's *W* test show that the assumption of sphericity is met (Mauchly's $W = .647$, $\chi^2_{(df=5)} = 11.61$, $p > .05$). The results of the Levene's test of equality of variances ($p > .05$) and Box's *M* test ($F = 1.17$, $p > .05$) show that the assumptions of both homogeneity of variances and homogeneity of covariance matrices, respectively, were fulfilled.

A two-way repeated measures of ANOVA was utilized to examine the differences between pre, 4th week, 8th week, and post mindfulness levels among the college students and whether these measures are different based on group.

Within-Subjects Effect: The results of the two-way ANOVA tests of within-subjects show no significant difference between pre, 4th week, 8th week, and post mindfulness levels ($F_{(df = 3,84)} = .76$, $p > .05$, $\eta^2 = .03$).

Between-Subjects Effect: The results of the two-way ANOVA tests of between-subjects show no significant difference between the control and intervention group on mindfulness levels ($F_{(df = 1,28)} = 2.61, p > .05, \eta^2 = .09$). Both control and intervention groups reported similar mean scores on mindfulness levels (control: $M = 129, SE = 3.46$; intervention: $M = 122, SE = 3.03$). Overall, the results show that group did not contribute any percentage to the variance in mindfulness levels.

Interaction effect: The results of the two-way ANOVA tests of with-in subjects effects show no significant interaction between time and group on mindfulness levels ($F_{(df = 3,84)} = 1.42, p > .05, \eta^2 = .05$) (Refer to Table 9).

Table 9. *Results of Two-Way Repeated Measure ANOVA Kentucky Inventory of Mindfulness Skills Summary*

Kentucky Inventory of Mindfulness Skills	Week1 Mean (SD)	Week4 Mean (SD)	Week8 Mean (SD)	Post Mean (SD)	F (Group)	F (Time)	F (Group X Time)
Group	125 (14.52)	123 (13.85)	125 (13.59)	126 (13.91)	2.61	.76	1.42
Control	131 (16.02)	128 (14.95)	129 (16.64)	128 (16.97)			
Intervention	120 (11.81)	119 (11.93)	123 (10.53)	124 (11.21)			

Perceived Stress Scale – Stress Measure

The following presents the results of the statistical analysis examining the hypothesis of students who receive the mindfulness based stress reduction instruction as a part of the cardiorespiratory walking for fitness instruction will show a decrease of perceived stress above the control group receiving only the cardiorespiratory walking for fitness instruction. The subsequent information presents the results of the mixed between-within-subjects analysis of variance for measures of perceived stress on daily step count, for repeated measures collected for one week during each data collection point (for pre, 4th week, 8th week, and post), among the college students based on the group: control or MBSR intervention group.

Prior to conducting the analysis, data were screened to ensure that the assumptions of this mixed design were fulfilled. Descriptive statistics, including skewness and kurtosis coefficients histograms, and normal Q-Q plots, were examined for pre, 4th week, 8th week, and post for both the control and intervention group. These measures and plots showed that the assumption of normality was fulfilled on the four measures of perceived stress across groups. In addition, the results of Mauchly's W test show that the assumption of sphericity is met (Mauchly's $W = .824$, $\chi^2_{(df=5)} = 5.37$, $p > .05$). The results of the Levene's test of equality of variances ($p > .05$) and Box's M test ($F = 5.54$, $p > .05$) show that the assumptions of both homogeneity of variances and homogeneity of covariance matrices, respectively, were fulfilled.

A two-way repeated measures of ANOVA was utilized to examine the differences between pre, 4th week, 8th week, and post perceived stress levels among the college students and whether these measures are different based on group.

Within-Subjects Effect: The results of the two-way ANOVA tests of within-subjects show no significant difference between pre, 4th week, 8th week, and post perceived stress levels ($F_{(df = 3,87)} = 2.56, p > .05, \eta^2 = .08$).

Between-Subjects Effect: The results of the two-way ANOVA tests of between-subjects show no significant difference between the control and intervention group on perceived stress levels ($F_{(df = 1,29)} = .88, p > .05, \eta^2 = .03$). Both control and intervention groups reported similar mean scores on perceived stress levels (control: $M = 15.66, SE = 1.22$; intervention: $M = 17.21, SE = 1.11$). Overall, the results show that group did not contribute any percentage to the variance in perceived stress levels.

Interaction effect: The results of the two-way ANOVA tests of with-in subjects effects show no significant interaction between time and group on perceived stress levels ($F_{(df = 3,87)} = .38, p > .05, \eta^2 = .01$). (Refer to Table 10).

Table 10. *Results of Two-Way Repeated Measure ANOVA Perceived Stress Summary*

Perceived Stress	Week1	Week4	Week8	Post	F (Group)	F (Time)	F (Group X Time)
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)			
Group	15 (5.06)	16 (5.55)	17 (5.34)	16 (5.61)	.88	2.56	.38
Control	13 (5.24)	15 (6.18)	16 (5.98)	16 (6.58)			
Intervention	16 (4.74)	17 (5.06)	17 (4.89)	17 (4.83)			

Chapter V

Discussion

The purpose of the study was to assess the effectiveness of a 15 week curriculum based physical activity intervention on increasing physical activity levels, mindfulness, and reducing perceived stress of college students. This chapter presents a discussion of the results for this study, and consists of the following sections: (a) hypotheses findings, (b) summary, and (c) conclusions and future research recommendations.

Hypothesis Findings

Physical Activity – Average Step Count

It was hypothesized that students who received the mindfulness based stress reduction instruction as a part of the cardiorespiratory walking for fitness instruction would show an increase in physical activity levels above the control group receiving only the cardiorespiratory walking for fitness instruction. The results of this study suggest no significant differences between students who received the mindfulness based stress reduction instruction as a part of the cardiorespiratory walking for fitness instruction versus the control group receiving only the cardiorespiratory walking for fitness instruction in physical activity levels based on group. The results show statistical significance within the control group overtime from the 4th week to the 8th week.

The within subjects ANOVA results revealed a significant increase in average steps from pre data collection point to the 4th week. These preliminary changes are

indicative of initial health behaviors of adults beginning physical activity programs. Studies examining physical activity interventions generally show consistent increases in physical activity in the short term (Kahn et al., 2002). The results revealed a significant decline in average steps for the 4th week data collection point to the 8th week data collection point in the control group. Both groups' measurements showed a decline in average steps from the 4th week to the 8th a viable explanation of the decline is that many students reported completing mid-term exams during the 8th week data collection.

One possible explanation for the results of no significance between groups was the elimination of group dialogue and discussion components of the MBSR program. These components target enhancing awareness in everyday life and individually tailored instruction on meditative walking and yoga to induce mindfulness. The PHED Walking for Fitness course is a 50 minute physical activity class meeting three times a week for 15 weeks. The intervention design incorporated 15 minutes of instructor lead guided mindfulness meditation for the intervention group and 15 minutes of instructor lead stretching in the control group at the beginning of each class session allowing time to ensure that students received the recommended 30 minutes of physical (Haskell, et al., 2007). The students enrolled in the walking for fitness course received 15 minutes of instructor-led group sessions three times each week for a total of 45 minutes of mindfulness meditation exposure, with no assigned homework practice. The MBSR program incorporates group dialogue and discussions aimed at enhancing awareness in everyday life, a component not integrated in the 15 minute guided mindfulness meditations of the study. The large group size was not conducive for the group dialogue and discussions which would require more time than the course permitted. The presence

of the participatory group discussions creates a supportive and deeply engaging learning environment that facilitates generalization of mindful behavior beyond the class meeting time.

An interesting finding not related to the hypothesis reveals that none of the student participants accumulated the recommended amount of daily steps. Currently, 10,000 steps per day is widely promoted as a target for achieving health-related benefits (Citrine Tudor-Locke & Bassett Jr, 2004). In a study examining the walking physical activity patterns of college students showed college students averaging 9932 steps a day (Behrens & Dinger, 2003) with another study reporting similar steps of 9318 (Mestek, Plaisance, & Grandjean, 2008). In both studies pedometers were distributed to students and students recorded daily steps in a log book before going to bed at night. Physical activity steps in this study were measured using the Omron HJ-720 ITC pedometer, which recorded and stored information in its memory for 42 days, reset automatically at midnight, and could not be zeroed manually. Both the control and intervention averages of 6312 and 6117 respectively, are below the recommended 10,000 steps per day and studies of self-reported pedometer step averages of college students at 9332 and 9318.

Although between groups findings did not reach statistical significance it is worth noting that the control groups decline in steps from 4th week to 8th week ($M_{4th} = 7180$, $M_{8th} = 5863$) of 1,317 steps was greater than the intervention group step change from 4th week to 8th week ($M_{4th} = 6578$, $M_{8th} = 5912$) of 665 steps. In comparison the control group exhibited a decline in steps that was 50% than that of the intervention group. Both groups increased in average steps pre to post data measurements with control groups step change ($M_{pre} = 6089$, $M_{post} = 6115$) of 24 steps measuring less than the intervention step

change ($M_{pre} = 5868$, $M_{post} = 6108$) of 240 steps, the intervention group increased average steps 9 times more than the control group. Baseline average step measurements show the control group acquiring 221 more steps than the intervention group while post average step measurements show only 7 steps acquired above the intervention group.

The step count findings in this study are consistent with prevalence data that describes physical inactivity in college students as similar to that of the general adult population. For example, 43% of the 2005 National College Health Assessment respondents reported that they did not engage in moderate exercise for at least 30 minutes or vigorous exercise for 20 minutes in the preceding 7 days (American College Health Association, 2006). These findings are of consequence because physical activity levels often decline during early adulthood (Caspersen, Pereira, & Curran, 2000) and the exercise habits developed during this time period are often sustained throughout a lifetime (Sparling & Snow, 2002). A clearer understanding of college students' physical activity behaviors is imperative for developing effective instructional physical education programs and interventions to combat physical inactivity and overweight and obesity in this cohort.

Kentucky Inventory of Mindfulness Skills - Mindfulness

It was hypothesized that students who received the mindfulness based stress reduction instruction as a part of the cardiorespiratory walking for fitness instruction would show an increase in mindfulness levels above the control group receiving only the cardiorespiratory walking for fitness instruction. The results of this study suggest no statistically significant differences between students who received the mindfulness based stress reduction instruction as a part of the cardiorespiratory walking for fitness

instruction versus the control group receiving only the cardiorespiratory walking for fitness instruction on mindfulness levels based on group.

One possible explanation for the results of no significance between groups is that the Auburn University stress reduction course, an adaptation of the traditional MBSR, requires students to commit to a 1 hour and 15 minutes, 2 days a week with instructor-led group sessions for a 15 week semester course (Sandage & Exford, 2011). While the traditional MBSR program typically requires participants to commit to a 2.5- to 3-hour instructor-led group session each week and 45 to 60 minutes of mindfulness practice each day for 8 weeks. To date, little is known about the dose effect of mindfulness based instruction. Jon Kabat-Zinn found, in a study examining the effects of stress reduction methods based on mindfulness meditation, to have positively influenced the rate at which psoriasis cleared in patients (J. Kabat-Zinn et al., 1998) following short exposures to mindfulness-based audiotape instruction. The patients were treated three times per week with patients typically completing treatment within 13 weeks. Exposure time to the guided audiotapes on meditation techniques increased from 5 minutes to approximately 10 minutes over the course of the study.

Although statistically significant findings were not found in the present study, there were meaningful findings based on the group means differences. At baseline the control group's mindfulness and step means ($M_{\text{pre(mind)}} = 131$, $M_{\text{pre(step)}} = 6089$) were higher than the intervention group ($M_{\text{pre(mind)}} = 120$, $M_{\text{pre(step)}} = 5868$) supporting studies that show that individuals who are successful at maintaining exercise tended to score higher on measures of mindfulness (Ulmer, Stetson, & Salmon, 2010). Mindfulness levels of the control group remained consistent for pre, 4th week, 8th week, and post ($M =$

131,128,129,128) respectively throughout the course. The intervention group showed changes in mindfulness scores throughout the course for pre, 4th week, 8th week, and post ($M = 120, 119, 123, 124$) respectively. It is interesting to note that while there was a significant change in steps from the 4th week to 8th week, the intervention group's results show an increase in mindfulness level greater than the control groups mindfulness level and the intervention group experienced a smaller reduction in steps than the control group. In spite of the fact that the control group's mindfulness level ($M_{8th} = 129$) was higher than the intervention groups mindfulness level ($M_{8th} = 123$) at the 8th week, the intervention groups steps were higher ($M_{8th(mind)} = 5912, M_{8th(step)} = 5863$). It appears that the intervention group reduced step count as mindfulness levels increased. Exercisers having greater mindfulness are less reactive; responding with more balanced appraisals to threats to their exercise regimen which in turn promotes increased exercise maintenance (Ulmer, et al., 2010).

Perceived Stress Scale – Stress

It was hypothesized that students who received the mindfulness based stress reduction instruction as a part of the cardiorespiratory walking for fitness instruction would show a decrease in perceived stress levels above the control group receiving only the cardiorespiratory walking for fitness instruction. The results of this study suggest no statistically significant differences between students who received the mindfulness based stress reduction instruction as a part of the cardiorespiratory walking for fitness instruction versus the control group receiving only the cardiorespiratory walking for fitness instruction in perceived stress levels based on group.

Re-emphasizing the explanation proposed for the non-significant findings of mindfulness levels between groups can be attributed to the lack of findings associated with the proposed reasoning of non-significance in mindfulness levels. Although a basic format of the MBSR was presented, incorporating the principles of mindfulness meditation through body scan, sitting, and lying breath techniques, several components were not imbedded because of the time dosage existing in the study. These aspects of the program are certainly active components of psychological processing of events. Much of the research conducted on the stress reducing benefits of MBSR has utilized participants who were motivated medical patients willing to make the time commitment necessary to satisfy the traditional MBSR program requirements.

Another explanation for the lack of significant findings is that there was variability in the standard deviations of the groups. When reviewing the standard deviations for perceived stress scale (PSS) it appears that the standard deviations for the PSS are considerably large this could explain the non-significant findings related to this dependent variable. There many possible reasons for this variability, for example, the population has diversity in the demands of academic course work, financial stability, job status, physical illness, and family concerns. More research is needed to better explain the amount of variability seen.

College students experience episodic stress uncommon to the general adult population— getting ready for an exam, completing and important paper or project, preparing for an important interview. During mid-term and finals, many students are bombarded with hectic study schedules, exam anxiety, and feeling of overwhelm are common during these times. Many college students are faced with challenges that require

responsiveness each semester often times to the same type of stressor academic requirement of courses, large financial expenditure for tuition and books, and time management of personal and academic priorities. College students experience increased stress over the course of single semesters or from year to year throughout the college education years compared to working individuals who are not faced with midterms, the loss of financial support from college, failing grade in a required class, academic probation, change in major, increased workload, change in relationship status (the ending or beginning of a relationship, major conflict with instructor, violations of law (ticketing, dui, disturbance of the peace), death of a family member, and illness all which can add to the normal stress of life.

Interestingly, the control groups perceived stress levels increased from pre throughout the 8th week ($M_{pre} = 13$, $M_{4th} = 15$, $M_{8th} = 16$). Whereas the intervention group's perceived stress levels showed a slight increase from pre to 4th week ($M_{pre} = 16$, $M_{4th} = 17$) then stress levels were attenuated throughout the 4th week to post ($M_{4th} = 17$, $M_{8th} = 17$, $M_{post} = 17$). The intervention groups stress levels did not increase during the 8th week, the week of mid-terms indicating a possibility of the influence of the intervention. Although the control group showed a greater degree of physical activity levels in the initial stages and lower perceived stress levels being reported the data warrants further investigation. It appears that while exercise helps in lowering individuals perceived stress exercise it may not completely help sustain this level during periods of stress.

Summary

The results of this study did not indicate significance for increasing physical activity levels or mindfulness levels nor was there significance in decreasing perceived stress levels. This study does however contribute to the distillation of knowledge in the assessment of mindfulness meditation and its effects on promoting physical activity which at present is in its earliest stages of investigation. At the time of literature review there were no empirical studies that had examined the effects of mindfulness based intervention on physical activity levels in college students. There is evidence that physical activity increased during a mindfulness intervention examining weight loss (Tapper, et al., 2009). Future studies should utilize a longitudinal design to examine causal relationships between the variables of physical activity, mindfulness, and perceived stress in physical activity instructional programs and the unique stress patterns and physical activity patterns of college students, who do not share the typical month in-month out routines of working individuals.

Conclusions and Further Research Recommendations

The following recommendations are resultant of this study:

1. It can be drawn that relationships between mindfulness meditation, perceived stress, and physical activity offers some support to pursue the creation of interventions that aim to increase physical activity using mindfulness meditation components.
2. There is a need to develop an intervention design that incorporates a physical activity course day of stress reduction skills using mindfulness meditation, group

dialogue and discussions aimed at enhancing awareness in everyday life with the remaining two class sessions focusing on cardiorespiratory fitness.

3. Future research should examine the development of a PHED Stress Reducing Exercise course with tailored instruction emphasizing exercise health behavior values, daily home assignments, and home practice website.
4. If the above process proves successful, an additional research goal would be to develop a program curriculum to be used for widespread empirical use in physical activity instructional programs.
5. Ultimately, longitudinal studies should be performed in order to evaluate the lasting values of such PHED instructional programs. Such longitudinal designs can initiate integrating mindfulness-based programs throughout the entire college population, addressing challenges and coping response to increase and maintain physical activity efforts of students throughout their college experience.
6. Beyond graduation, further longitudinal studies may investigate long-term influences of mindfulness based stress reduction on physical activity lifestyle behaviors into adulthood.

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APPENDICES

Appendix A—Perceived Stress Scale

PERCEIVED STRESS SCALE

Sheldon Cohen

The *Perceived Stress Scale* (PSS) is the most widely used psychological instrument for measuring the perception of stress. It is a measure of the degree to which situations in one's life are appraised as stressful. Items were designed to tap how unpredictable, uncontrollable, and overloaded respondents find their lives. The scale also includes a number of direct queries about current levels of experienced stress. The PSS was designed for use in community samples with at least a junior high school education. The items are easy to understand, and the response alternatives are simple to grasp. Moreover, the questions are of a general nature and hence are relatively free of content specific to any subpopulation group. The questions in the PSS ask about feelings and thoughts during the last month. In each case, respondents are asked how often they felt a certain way.

Evidence for Validity: Higher PSS scores were associated with (for example):
 failure to quit smoking
 failure among diabetics to control blood sugar levels
 greater vulnerability to stressful life-event-elicited depressive symptoms
 more colds

Health status relationship to PSS: Cohen et al. (1988) show correlations with PSS and:
 Stress Measures, Self-Reported Health and Health Services Measures, Health Behavior Measures, Smoking Status, Help Seeking Behavior.

Temporal Nature: Because levels of appraised stress should be influenced by daily hassles, major events, and changes in coping resources, predictive validity of the PSS is expected to fall off rapidly after four to eight weeks.

Scoring: PSS scores are obtained by reversing responses (e.g., 0 = 4, 1 = 3, 2 = 2, 3 = 1 & 4 = 0) to the four positively stated items (items 4, 5, 7, & 8) and then summing across all scale items. A short 4 item scale can be made from questions 2, 4, 5 and 10 of the PSS 10 item scale.

Norm Groups: L. Harris Poll gathered information on 2,387 respondents in the U.S.
Norm Table for the PSS 10 item inventory

Category	N	Mean	S.D.
Gender			
Male	926	12.1	5.9
Female	1406	13.7	6.6
Age			
18-29	645	14.2	6.2
30-44	750	13.0	6.2
45-54	285	12.6	6.1
55-64	282	11.9	6.9
65 & older	296	12.0	6.3
Race			
white	1924	12.8	6.2
Hispanic	98	14.0	6.9
black	176	14.7	7.2
other minority	50	14.1	5.0

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Perceived Stress Scale

The questions in this scale ask you about your feelings and thoughts **during the last month**. In each case, you will be asked to indicate by circling *how often* you felt or thought a certain way.

Name _____ Date _____

Age _____ Gender (*Circle*): **M F**

0 = Never	1 = Almost Never	2 = Sometimes	3 = Fairly Often	4 = Very Often	
1. In the last month, how often have you been upset because of something that happened unexpectedly?.....	0	1	2	3	4
2. In the last month, how often have you felt that you were unable to control the important things in your life?.....	0	1	2	3	4
3. In the last month, how often have you felt nervous and "stressed"?	0	1	2	3	4
4. In the last month, how often have you felt confident about your ability to handle your personal problems?.....	0	1	2	3	4
5. In the last month, how often have you felt that things were going your way?.....	0	1	2	3	4
6. In the last month, how often have you found that you could not cope with all the things that you had to do?	0	1	2	3	4
7. In the last month, how often have you been able to control irritations in your life?.....	0	1	2	3	4
8. In the last month, how often have you felt that you were on top of things?.....	0	1	2	3	4
9. In the last month, how often have you been angered because of things that were outside of your control?	0	1	2	3	4
10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?.....	0	1	2	3	4

Please feel free to use the *Perceived Stress Scale* for your research. The PSS Manual is in the process of development, please let us know if you are interested in contributing.

Mind Garden, Inc.

1690 Woodside Road, Suite #202 Redwood City, CA 94061 USA Phone: (650) 261-3500 Fax: (650) 261-3505 e-mail: mindgarden@msn.com www.mindgarden.com

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The PSS Scale is reprinted with permission of the American Sociological Association, from Cohen, S., Kamarck, T., and Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, 24, 386-396.
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Appendix B—Kentucky Inventory of Mindfulness Skills

Kentucky Inventory of Mindfulness Skills
Ruth A. Baer, Ph.D. University of Kentucky

Please rate each of the following statements using the scale provided. Write the number in the blank that best describes your own opinion of what is generally true for you.

1	2	3	4	5
Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true

1

- ___ 1. I notice changes in my body, such as whether my breathing slows down or speeds up.
- ___ 2. I'm good at finding the words to describe my feelings.
- ___ 3. When I do things, my mind wanders off and I'm easily distracted.
- ___ 4. I criticize myself for having irrational or inappropriate emotions.
- ___ 5. I pay attention to whether my muscles are tense or relaxed.
- ___ 6. I can easily put my beliefs, opinions, and expectations into words.
- ___ 7. When I'm doing something, I'm only focused on what I'm doing, nothing else.
- ___ 8. I tend to evaluate whether my perceptions are right or wrong.
- ___ 9. When I'm walking, I deliberately notice the sensations of my body moving.
- ___ 10. I'm good at thinking of words to express my perceptions, such as how things taste, smell, or sound.
- ___ 11. I drive on "automatic pilot" without paying attention to what I'm doing.
- ___ 12. I tell myself that I shouldn't be feeling the way I'm feeling.
- ___ 13. When I take a shower or bath, I stay alert to the sensations of water on my body.
- ___ 14. It's hard for me to find the words to describe what I'm thinking.
- ___ 15. When I'm reading, I focus all my attention on what I'm reading.
- ___ 16. I believe some of my thoughts are abnormal or bad and I shouldn't think that way.
- ___ 17. I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.
- ___ 18. I have trouble thinking of the right words to express how I feel about things.
- ___ 19. When I do things, I get totally wrapped up in them and don't think about anything else.
- ___ 20. I make judgments about whether my thoughts are good or bad.
- ___ 21. I pay attention to sensations, such as the wind in my hair or sun on my face.

Revised date (4 October 2006)

1	2	3	4	5
Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true

- ____ 22. When I have a sensation in my body, it's difficult for me to describe it because I can't find the right words.
- ____ 23. I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.
- ____ 24. I tend to make judgments about how worthwhile or worthless my experiences are.
- ____ 25. I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.
- ____ 26. Even when I'm feeling terribly upset, I can find a way to put it into words.
- ____ 27. When I'm doing chores, such as cleaning or laundry, I tend to daydream or think of other things.
- ____ 28. I tell myself that I shouldn't be thinking the way I'm thinking.
- ____ 29. I notice the smells and aromas of things.
- ____ 30. I intentionally stay aware of my feelings.
- ____ 31. I tend to do several things at once rather than focusing on one thing at a time.
- ____ 32. I think some of my emotions are bad or inappropriate and I shouldn't feel them.
- ____ 33. I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow.
- ____ 34. My natural tendency is to put my experiences into words.
- ____ 35. When I'm working on something, part of my mind is occupied with other topics, such as what I'll be doing later, or things I'd rather be doing.
- ____ 36. I disapprove of myself when I have irrational ideas.
- ____ 37. I pay attention to how my emotions affect my thoughts and behavior.
- ____ 38. I get completely absorbed in what I'm doing, so that all my attention is focused on it.
- ____ 39. I notice when my moods begin to change.

Revised date (4 October 2006)

Appendix C—Consent Form



INFORMED CONSENT

for a Research Study entitled

“Mindful Exercise, Stress Reduction and Self Compassion: The Effects of A University Physical and Health Education Mindfulness-Based Exercise Course In Increasing Physical Activity”

You are invited to participate in a research study to assess the effectiveness of a 15 week curriculum based physical activity intervention on increasing physical activity levels, exercise adherence and reducing perceived stress of college students. The study is being conducted by Tiff Exford, doctoral student, under the direction of Dr. David Pascoe in the Auburn University Department of Kinesiology. You have been selected as a possible participant because you are enrolled in the PHED 1600 Walking for Fitness course and are age 19 or older.

What will be involved if you participate? If you decide to participate in this research study, you will be asked to wear the HJ-720ITC Omron pedometer, this pedometer offers a 7-day recall on the pedometer display and a storable memory for measures of daily step counts, aerobic step counts (60 steps per minute for more than 10 pedometer minutes continuously), prediction of caloric expenditure, and distance walked. You will wear the pedometer at the beginning, week 4, week 8, and the end of the course as required by the course. You will also be asked to complete a Kentucky Inventory Mindfulness of Skills Survey and a Perceived Stress Scale online at the beginning, week 4, week 8, and the end of the course as required by the course. The Kentucky Inventory of Mindfulness Skills survey measures 4 factors representing elements of mindfulness: observing or attending to sensations, perceptions, thoughts, and feelings; describing or non-judgmental labeling of these internal experiences with words; acting with awareness rather than on “automatic pilot”; accepting without judgment accepting, allowing, or being nonjudgmental or non-evaluative about present moment experience. The Perceived Stress Scale is used for measuring the perception of stress. It is a measure of the degree to which situations in one’s life are appraised as stressful. You are giving permission to use information collected about as a part of the course activities in this research study. There is no additional time commitment for the research from what you will be doing as a part of the course.

Participant’s initials

Page 1 of 2

Are there any risks or discomforts? There are no associated risks or discomforts.

Are there any benefits to yourself or others? While it cannot be guaranteed that you will receive direct benefits from participating in the current study, if you participate in this study, you may experience the merits of regular physical activity which range from preventing chronic health conditions to promoting weight loss and better sleep. Previous participants in the MBSR program have learned effective ways to manage their stress levels and have experienced improved sleep, improved mood, and a reduction in their stress levels. If you desire, you may obtain a brief report of your scores on the questionnaires following completion of the study in order to observe any changes that may have occurred. We/I cannot promise you that you will receive any or all of the benefits described. Although there may be benefits to course participation, there are no additional benefits to allowing your data to be used for research participation. The benefits of this research information may indicate that the semester-long format for teaching a university physical education movement incorporating mindfulness-based stress reduction increases physical activity levels of student above that of a traditional walking physical activity course.

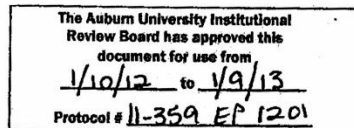
There are no costs to participate.

If you change your mind about participating, you can withdraw at any time during the study. Your participation is completely voluntary. If you choose to withdraw, your data can be withdrawn as long as it is identifiable. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with Auburn University, the Department of Kinesiology.

Your privacy will be protected.

Any information obtained in connection with this study will remain anonymous (*or confidential*). Your informed consent and online survey information will be stored in a locked box in a confidential location under the care of the researcher. The information will be given to the researcher anonymously and will remain identifiable only to the course instructor. Information obtained through your participation may be published in a professional journal and presented at a professional conference, but such information will not be directly connected with you. If you have questions about this study, *please ask them now* or contact TJ Exford, M. Ed., by phone 334-202-2333 email tjexford@auburn.edu or Dr. David Pascoe, Ph.D. by phone 334-844-1479 or email pascodd@auburn.edu.

Participant's initials



Page 2 of 3

If you have questions about your rights as a research participant, you may contact the Auburn University Office of Human Subjects Research or the Institutional Review Board by phone (334)-844-5966 or e-mail at hsubjec@auburn.edu or IRBChair@auburn.edu.

HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE WHETHER OR NOT YOU WISH TO PARTICIPATE IN THIS RESEARCH STUDY. YOUR SIGNATURE INDICATES YOUR WILLINGNESS TO PARTICIPATE.

Participant's signature Date Investigator obtaining consent Date

Printed Name Printed Name

Co-Investigator Date

Printed Name

The Auburn University Institutional
Review Board has approved this
document for use from
1/10/12 to 1/9/13
Protocol # 11-359 EP 1201

Appendix D—Walking Course Curriculum

Lesson plans for Stretching & Walking

Objectives		<ul style="list-style-type: none"> accumulate 30 mins of moderate aerobic activity daily accumulate 10,000 steps daily
Week 1 <i>pedometers & surveys</i> <i>Jan 9</i>	Objective	Outer perimeter
	15 min stretching alt A	30 min walk coliseum
Week 2 <i>Jan 16</i>	15 min stretching alt A	Inner perimeter
		30 min walk coliseum
Week 3 <i>Jan 23</i>	15 min stretching alt A	Outer perimeter counter clockwise
		30 min walk coliseum
Week 4 <i>pedometers & surveys</i> <i>Jan 30</i>	15 min stretching alt B	Inner perimeter counter clockwise
		30 min walk coliseum
Week 5 <i>Feb 6</i>	15 min stretching alt B	Outer Perimeter
		30 min walk coliseum
Week 6 <i>Feb 13</i>	15 min stretching alt B	Inner Perimeter
		15 min walk stadium coliseum
		15 min walk inner perimeter coliseum
Week 7 <i>Feb 20</i>	15 min stretching alt B	Outer perimeter counter clockwise
		30 min walk coliseum
Week 8 <i>pedometers & surveys</i> <i>Feb 27</i>	15 min stretching alt A	Inner Perimeter counter clockwise
		15 min walk stadium coliseum
		15 min walk inner perimeter coliseum
Week 9 <i>Mar 5</i>	15 min stretching alt A	Outer perimeter
		30 min walk coliseum

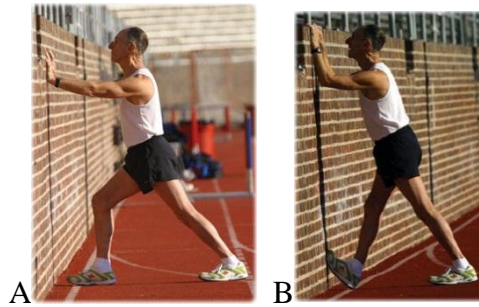
Week 10 <i>Mar 19</i>	15 min stretching alt A	30 min walk track
Week 11 <i>Mar 26</i>	15 min stretching alt A	Outer perimeter
		30 min walk coliseum
Week 12 <i>Apr 2</i>	15 min stretching alt B	20 min walk track
		10 min walk ramps
Week 13 <i>pedometers & surveys Apr 9</i>	15 min stretching alt B	Outer perimeter counter clockwise
		30 min walk coliseum
Week 14 <i>Apr 16</i>	15 min stretching alt B	30 min walk track counter clockwise
Week 15 <i>Apr 23</i>	South entrance Coliseum ground level 15 stretching 30 min campus walk	
<i>Inclement Weather</i> Students will meet South entrance Coliseum upper level.		

Alternative A – Stretches: hold each stretch for 30 seconds both sides

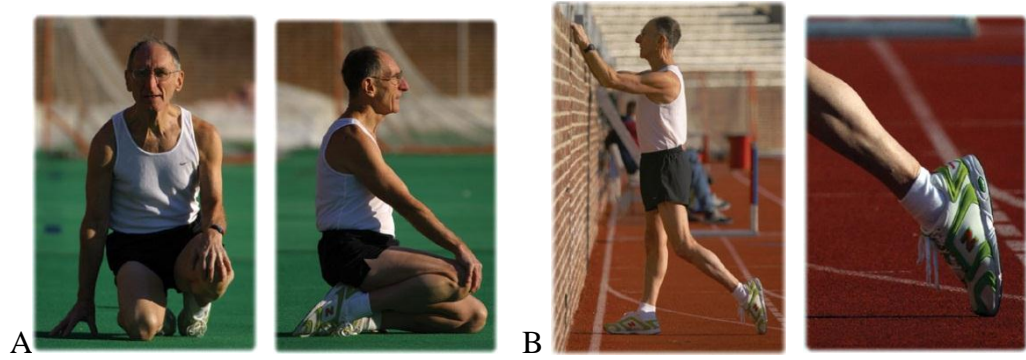
Shoulder



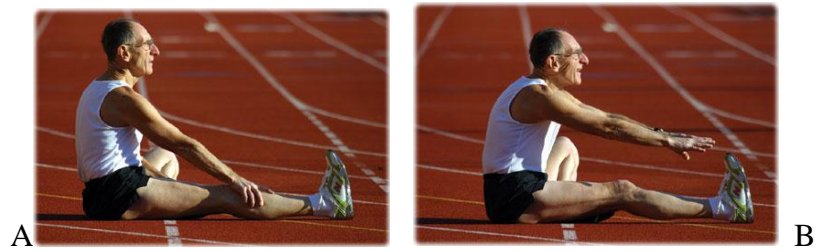
Calf



Shin



Hamstring

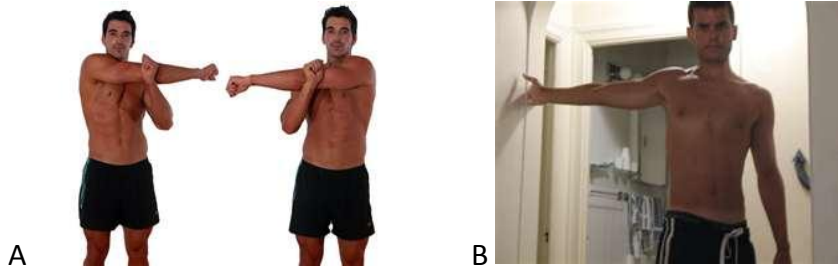


Quad

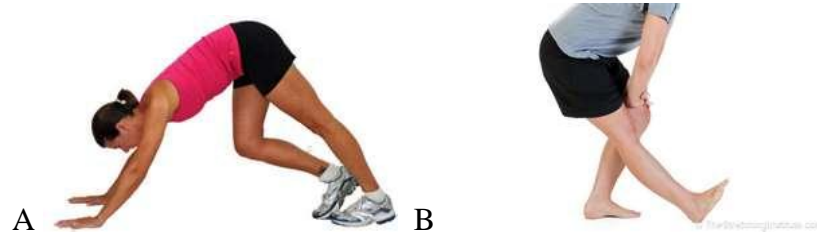


Alternative B– Stretches: hold each stretch for 30 seconds both sides

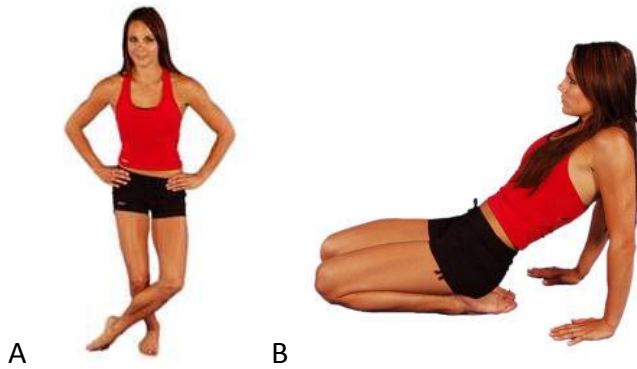
Shoulder



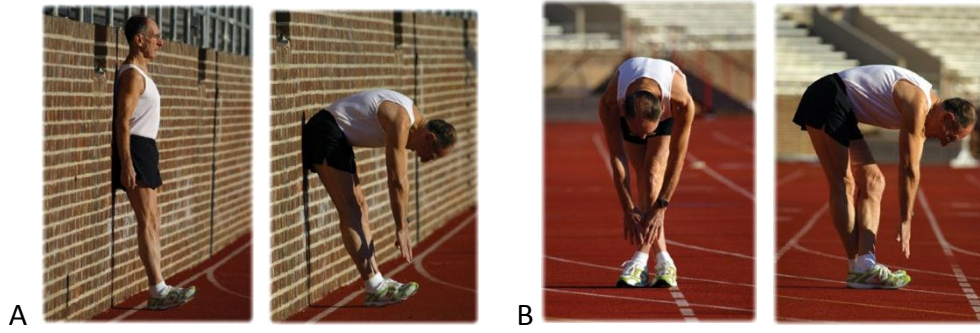
Calf



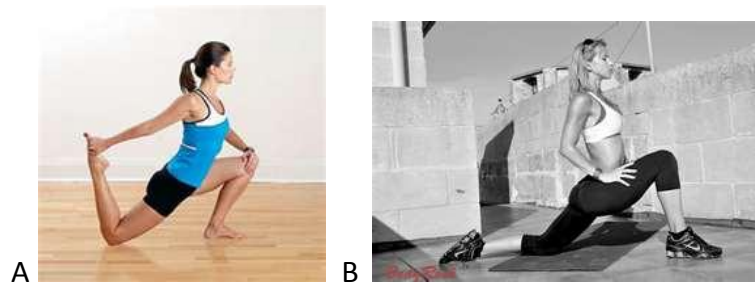
Shin



Hamstring



Quad



Appendix E—Mindfulness Course Curriculum

Lesson plans Mindfulness & Walking

Objectives	<ul style="list-style-type: none"> • increase mindfulness • decrease perceived stress • increase self-compassion 	<ul style="list-style-type: none"> • accumulate 30 mins of moderate aerobic activity daily • accumulate 10,000 steps daily
Week 1 <i>pedometers & surveys</i> <i>Jan 9</i>	Mindfulness Intro room 1084	Inner perimeter
	guided audio	30 min walk coliseum
Week 2 <i>Jan 16</i>		Outer perimeter
	body scan	30 min walk coliseum
	guided audio	
Week 3 <i>Jan 23</i>	body scan	Inner perimeter counter clockwise
	yoga	30 min walk coliseum
	guided audio body scan	
Week 4 <i>pedometers & surveys</i> <i>Jan 30</i>	lying meditation	Outer perimeter counter clockwise
	yoga	30 min walk coliseum
	guided audio lying	
Week 5 <i>Feb 6</i>	lying meditation	Inner Perimeter
	yoga	15 min walk stadium coliseum
	guided audio lying	15 min walk inner perimeter coliseum
Week 6 <i>Feb 13</i>	sitting meditation	Outer perimeter
	yoga	30 min walk coliseum
	guided audio sitting	
Week 7 <i>Feb 20</i>	sitting meditation	Inner Perimeter counter clockwise
	yoga	15 min walk stadium coliseum
	guided audio sitting	15 min walk inner perimeter coliseum
Week 8 <i>pedometers & surveys</i> <i>Feb 27</i>	loving kindness meditation	Outer perimeter counter clockwise
	yoga	30 min walk coliseum
	guided audio loving kindness	

Week 9 <i>Mar 5</i>	loving kindness meditation	30 min walk track
	yoga	
	guided audio loving kindness	
Week 10 <i>Mar 19</i>	body scan	Outer perimeter
	yoga	30 min walk coliseum
	guided audio body scan	
Week 11 <i>Mar 26</i>	lying meditation	20 min walk track 10 min walk ramps
	yoga	
	guided audio lying	
Week 12 <i>Apr 2</i>	sitting meditation	Outer perimeter counter clockwise 30 min walk coliseum
	yoga	
	guided audio sitting	
Week 13 <i>pedometers & surveys</i> <i>Apr 9</i>	loving kindness meditation	30 min walk track counter clockwise
	yoga	
	guided audio loving kindness	
Week 14 <i>Apr 16</i>	guided audio sitting	Outer perimeter 30 min walk coliseum
	guided audio lying	
	guided audio body scan	
Week 15 <i>Apr 23</i> <i>Inclement Weather</i>	South entrance Coliseum ground level 15 stretching 30 min campus walk	
	Students will meet South entrance Coliseum upper level.	

